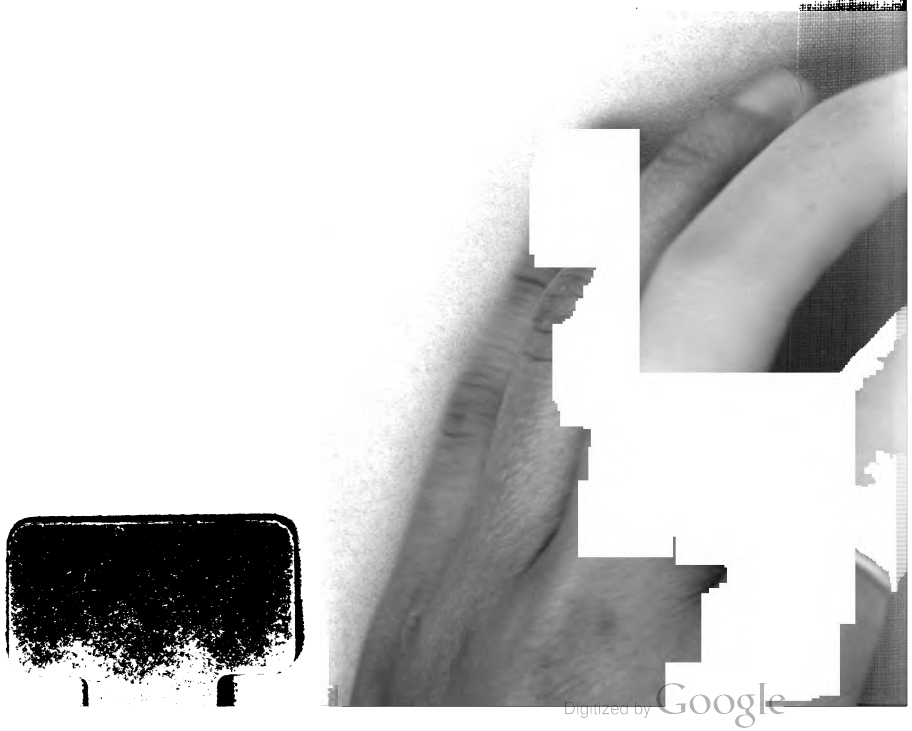

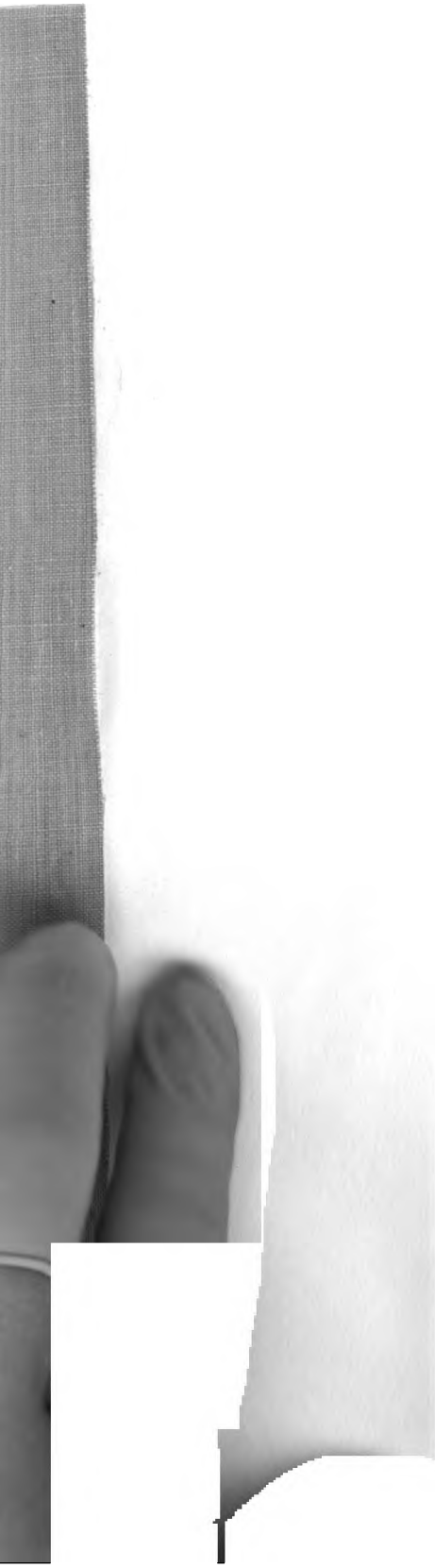

PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

No. 1.—Jan'y, Feb'y and March, 1867.

PHILADELPHIA:
ACADEMY OF NATURAL SCIENCES,
Corner of Broad and Sansom Streets.
1867.

PROCEEDINGS

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ACADEMY OF NATURAL SCIENCES

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PHILADELPHIA.

1867.

Jan. 1*st.*

MR. VAUX, Vice-President, in the Chair.

Twenty-nine members present.

The following deaths were announced:

Edward F. Sanderson, Esq., Member; and Rev. Stephen Elliott, of Georgia, and Prof. Geo. W. Featherstonhaugh, of Havre, France, Correspondents.

Jan. 8*th.*

The President, DR. HAYS, in the Chair.

Thirty-six members present.

Jan. 15*th.*

MR. VAUX, Vice-President, in the Chair.

Twenty-nine members present.

Jan. 22*d.*

MR. VAUX, Vice-President, in the Chair.

Thirty-four members present.

Jan. 29*th.*

The President, DR. HAYS, in the Chair.

Twenty-seven members present.

Dr. H. C. Wood tendered his resignation as Recording Secretary.

The following gentlemen were elected members:

J. E. Farnum, W. H. Stevens, Edw. B. Edwards, Dr. James Levick, Charles Gibbons, John B. Austin, Wm. S. Baird, Edwin Greble, Walter B. Smith, C. F. Haseltine and Wilson M. Jenkins.

The following were elected correspondents:

Prof. O. C. Marsh, New Haven, Conn., and Prof. Wm. H. Brewer, New Haven, Conn.

Pursuant to the By-Laws, an election of members of the Standing Committees for the ensuing year was to be held, but was deferred until the next meeting for business.

On favorable report of the committee the following paper was ordered to be published:

On a new genus in HOMOPTERA,—(Section Monomera.)

BY HENRY SHIMER, M. D.

Characters for a supposed new Family.

DACTYLOSPHÆRIDÆ, Shimer.

Wings four, carried flat on the back in repose.

Antennæ few, jointed.

Tarsi composed of one joint, terminated by two claws, and from two to six *digituli.**

Honey-tubes none; otherwise resembling *Aphidæ*.

DACTYLOSPHÆRA. New genus.†

Male—Anterior wing with one one-branched discoidal, and a stigmatic nervure; posterior wing with no discoidal.

Female—Apterous, body thick, clumsy, subellipsoidal.

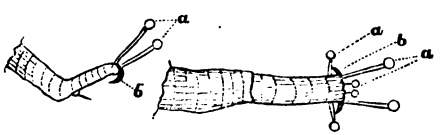
Common Characters—Antennæ 3–4 jointed. Tarsi, six digituli. Promuscis sheath four-jointed,

DACTYLOSPHÆRA GLOBOSUM, n. sp.

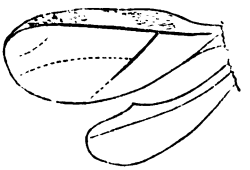
Inhabits galls on the Pig-nut Hickory, (Carya glabra.)

Male—Abdomen and prothorax orange-yellow; mesothorax, head and eyes, blackish; legs and antennæ dark cinereous. Wings hyaline, broad, somewhat overlapping as they lie horizontally on the back. Anterior wing, even-

* I suggest this name, *digituli*, from the Latin *digitulus*, a small finger or toe, for these remarkable organs; it appears to me appropriate, because they are arranged around the foot somewhat like the toes of an animal.



A. B.



D.

A.—a side view of the foot of *D? vitifoliæ* magnified; *a*, the two *digituli*; *b*, the claws.

B.—a vertical view of the foot of *Dactylosphæra globosum*, from above, magnified; *a*, the six *digituli*; *b*, the claws, as they may be seen while the insect attempts to walk on the glass plate of a microscope.

C.

C.—the promuscis sheath of *D. globosum*.

D.—Upper and under wing of *Dactylosphæra? vitifoliæ* greatly magnified. This figure was drawn from the only specimen I have remaining, (from the Clinton grape gall.) The dotted lines in the anterior wing are what I saw under the microscope in the recent specimen; the shading between the costal and subcostal nerves represents a hazy appearance, as I saw it under the microscope. The vein in the posterior wing is very obscure, but I saw it with an excellent simple lens.

† From δακτυλος, a finger or toe, and σφαῖρα, a globe, on account of the slender globe-ended appendages of the tarsi,—*digituli*.

ly rounded on the posterior margin; anterior margin rather straight, somewhat curved, convex at the middle of the stigma, apex quite broadly rounded, the wide wedge-shaped base not extending beyond the middle; stigmatic nervure nearly straight, terminating in the centre of the apex, not visible at either end. The discoidal within the middle of the wing, not visible at its outer end, somewhat convex anteriorly, its branch hyaline at its extremities; stigma honey yellow, darkest on the costal margin, the apical end lanceolate; inwardly extending to the base of the wing, all the costal space being of the same color. Posterior wing, one longitudinal vein and no discoidal. Tibiæ and tarsi with a few scattering hairs; claws paleish horn-colored, with blackish tips. Antennæ four-jointed, sublinear, 1st and 2d short and thick, the others long, the third on a narrow pedicel, which may be a small joint, fourth clavate. Length to tip of wings ·07 inch; body about ·025 inch long.

Female much resembling the "grape leaf louse," (*D? vitifoliæ*), but smaller, the dull pointed promuscis blackish at the extremity; eyes of few (about five) facets.

Eggs similar to those of the "grape leaf louse." Smaller and of a deeper yellow.

Pupa of male orange-yellow, sometimes inclined to greenish; undeveloped wings pale yellow; body somewhat elongate; abdomen pointed; antennæ linear, three-jointed, 1st thick, subglobose; 2d smaller, short, thick; 3d very long, clavate, obliquely pointed, without a spine at the apex, a spine on the inner side of the first and second joints.

Gall variable in size, often numerous in the parenchyma of the leaf, others on the veins and leaf stalks, all opening on the lower side of the leaf, with a very small orifice; smoothish, of a somewhat leathery structure, pale yellowish-green, glaucus or dark green; subglobose or sometimes somewhat irregular, without any of the mealy sugary dust within, which is common in galls of the *Aphis* family.

There is apparently a disposition among some authors to create separate species out of the insects inhabiting galls thus variable, according to their size and location. The small subglobular galls, about ·09—·14 in. in diameter, in the plane of the leaf, and about ·04—·06 in. in a perpendicular direction through it, are often very abundant, and when quite full of eggs I have counted about 50; the young larva usually leaves the gall as soon as hatched, and proceeds, as does the "grape leaf louse" (*D? vitifoliæ*), to construct a new gall; sometimes these small galls contain several females, but I have never found males in them; the male-producing galls are larger, of various sizes, up to ½ of an inch or even more in diameter. During the summer and autumn and former years, I have examined many of these galls, some of them are globular, others somewhat irregular. In my original studies I took notes of them as distinct species; they were on the leaf-stalks, veins, and in the parenchyma, occasionally near the border of the leaf, most frequently in the parenchyma of the leaf, close to the veins and midribs, so that at first view I was led to believe that they were originally formed in the latter, but upon dissection I found them usually entirely in the parenchyma, the gall freely separating from the veins; these were filled with eggs, larva, pupa, and imago.

The winged males were numerous, but, as the weather then was very wet, they were in an extremely bad condition, their wings adhering to the walls of the galls and to their own bodies from the excessive dampness in the galls; but among the hundreds observed I saw a number of perfect specimens. Subsequently, in more pleasant weather, I examined several dark green, more perfectly globular galls, located as those observed before, with a good supply of winged specimens in perfect condition. I made careful examination and notes as before, and found that they agreed with the former precisely and, compared favorably with the former dried specimens; and furthermore, I made a careful microscopic examination of the larva in comparison with

those in the small galls above alluded to, and I could detect no difference; both kinds existed on the same leaves frequently, and sometimes on different leaves of the same tree; other trees have numerous galls all of the small size; in none of these small galls, after the most diligent search, have I ever been able to find a winged male. The conclusion that I have arrived at is that the galls that produce the winged males develope to a larger size, so as to make room for the coming winged inhabitant, on the great principle or law of nature that provides for the wants of every creature, often in a mysterious manner. These small subglobular galls could not conveniently accommodate the winged males. The male-producing grape leaf gall, also, is very long and well developed, so far as my limited observations have extended, while galls containing fertile females are variable from large to even quite small. From my examinations of these Hickory-leaf gall insects, I never saw the males support themselves by their wings, although they attempted flight when dropped properly from the point of a needle; the atmospheric temperature then was moderately cool, which may account for their weakness. When they attempt to fly, the hook of the posterior wing clasps the thickened posterior border of the anterior wing, but not when at rest. The male of the grape leaf (*vitifoliæ*) gall insect also thus made several ineffectual attempts at flight, but was not able to support its body; how this might be in a very warm sunny day I did not have the privilege of determining.

During my microscopic examinations I became convinced that the apparent enlargement of the posterior border of the anterior wing of these insects, is not a developement of a nervure or a mere tumefaction of the border, but a rolling up of the margin like a scroll, which much more admirably fits it for a permanent retaining point for the hook on the anterior margin of the posterior wing.

To make a thorough examination of the feet and their appendages, the living insect is the only material from which it can be satisfactorily done. The *two* claws, as in the case of the "grape leaf louse," can be easily seen as the insect attempts to walk on the glass plate. The tarsi of the larva and female only have two conspicuous digituli, but the male, as it approaches the imago state, develops six; these I observed in the pupa, being the most convenient state for the examination of these organs; those in the middle, between the long or principal pair, are not always so conspicuous, but may be plainly seen under proper circumstances; more frequently they appear as one short stub-like spine.

The knobs on the extremities of the principal digituli, over the claws, are globular, while those on the middle and lateral ones are obovoid and comparatively small.

The legs, feet, etc., of the male imago are much longer than in any other state, hence they appear to be the best material for satisfactory examination, regarding the problem of one or two joints for the tarsi. While the insect was walking slowly under the microscope, I beheld, in a vertical direction, that the tarsi are composed of at least three rings or segments, none of which presented a movable joint; I then crushed the abdomen, but did not injure the thorax; by this means I brought some of the legs on the side, so that the joints moved in a plane parallel with the glass plate; this also had the advantage of confining the insect to the spot, and, as I did not injure the thorax, I had a fair opportunity of examining the tarsi for a long time, with the advantage of such motion as I desired while the insect struggled for freedom; this view of the tarsi demonstrates that they are composed of four rings soldered together, none of them gave the slightest joint-like motion; the upper ring is the most plainly distinct from the succeeding one; on the under side of the foot I beheld some constriction, but on the sides and above there is none; I observed this with great care, but saw no motion, the bending of the foot being confined entirely to the articulation of the tarsus with the tibia. I then, by way of comparison, examined, under similar circumstances,

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the foot of a species of *Aphis*, abundant on the apple trees, and saw it composed of the same number of rings; the upper one at its union with the succeeding showed some constriction, as seen either from *above* or from the side view; moreover the motion of a joint was very satisfactorily seen, the insect sometimes bending it alone, at other times in conjunction with the tibio-tarsal joint.

Now, in view of these facts, I can see no reason for claiming two joints for the tarsi of this insect. It would be as reasonable to suppose that each primary ring was a joint, and then we would have four, which, with the digituli that might be the representatives of another joint, give five undeveloped joints—joints in embryo—the highest number in the more perfect *Insectians;* but in the case of this and other species of this family, which I have observed, all are soldered together. By extending my examinations to the tibia I found it composed of about 50 similar primary rings, each one of which was plainly widened from above downward, thus agreeing in the general structural anatomy with the tarsus. This same primary annulated structure I beheld in the antennæ of these insects, also in several species of Aphidæ to which I extended my observations by way of comparison.

Frequently the distal or wide end of these primary rings is prolonged into spines, &c., more or less numerous according to the species of insect. These observations give us a view of the true primary anatomical structure of the long members of insects, for this annulated structure very probably exists in the long members of all insects, although not so readily detected, in many cases, as in the translucent limbs of these insects. Furthermore, these observations lead us to be careful about pronouncing upon the number of joints in the tarsi. To designate each one of these rings as a true joint would lead us at once into inconsistencies, for any anatomist could not presume that the tibia is composed of 50 joints, or the antennæ of this insect, and many species of the *Aphidæ*, of perhaps hundreds; hence, where we behold in the tarsi precisely the same structure, we are no more justifiable in ascribing to it 4 or 5 joints, or even *two*, without beholding the motion of a joint, or the usual constriction. In view of these facts I have made extended and careful observations on the tarsi of these insects, and have become entirely satisfied that there is but *one* joint. These are my reasons for believing that these insects belong to a new family between the *Aphidæ* and *Coccidæ*.

The promuscis sheath of this insect I examined under more favorable conditions than that of the "grape leaf louse," and clearly saw four joints; and if, as I believed, there are two in close proximity, as shown in the magnified sketch at *a*, fig. C, on page 1, there are five joints, while in the latter I did not succeed in distinguishing more than three; perhaps with proper material the same arrangement may be discovered in the latter as in the former species. In *D. globosum* I had an abundance of male pupæ and winged imagos for examination, while in the *D? vitifoliæ* I was chiefly confined to females and larvæ. The bundle of setæ I could not separate, although I made numerous examinations, with the living insect on its back, for the purpose of ascertaining positively. I often saw the insect take hold of it by grasping it between the claws and the foot, pulling and bending it in various directions, sometimes seizing it with two feet and pulling in opposite directions, yet I could not determine more than one piece.

DACTYLOSPHÆRA? VITIFOLIÆ * (The "Grape leaf louse.")
Pemphigus vitifoliæ, Fitch, 1st and 2d Reports, p. 158. Walsh, Practical Entomologist, vol. i., p. 111.

* Not wishing to multiply genera unnecessarily, I have not constructed a new genus for this insect, but my convictions are that there are characters that probably warrant its separation from *Dactylosphæra*, according to custom. The stigmatic nervure was absent in all the specimens I saw, but upon close examination with a microscope of moderate power, in one specimen I imagined that I saw part of a faint dark line in one wing, where it might be sought for. The branch of

Inhabits galls on the grape leaf, tendrils and vine.

Male—Body moderately slender; abdomen sharply taper-pointed, with a few scattering hairs at the extremity; head short; neck thick. Body, head, legs, and antennæ light yellow, the two latter palest; a broad dark band encircling the middle of the thorax. Wings membranaceous, hyaline; in repose, somewhat overlapping, rather wide or diverging behind the extremeties; in the only entirely perfect specimen observed were slightly curved upwards. Anterior wing widest in the middle, subobovate; posterior margin one regular curve or arc of a circle from the base to the outer extremity; apex completely rounded and comparatively broader than I have observed of our common *Aphidæ;* anterior margin irregularly convex, the greatest convexity being somewhat nearer the basal extremity, where it is considerably rounded forward; a small, inconspicuous costal, and a yellowish strong subcostal nerve; one dark discoidal springing from about the basal third or fourth of the subcostal and shading off or becoming lost in the membrane before reaching the border; outlines of these nervures rather hazy, obscure, not sharply defined;† a long, very obscure branch passes longitudinally from near the middle of the discoidal, in some specimens scarcely, if at all, perceptible; part of the costal space near the base, and an imperfect, undefined stigma, light fulvous. Posterior wing, small, narrow; no discoidal nerve; subcostal scarcely perceptible, somewhat near the costal. Tibiæ and tarsi with a few hairs or spines, a somewhat prominent one beneath the foot near the joint. The digituli, with their conspicuously globular extremities, arise from the extremity of the tarsi, just above the claws, and project beyond the long subcylindrical tarsi about one-half their length, and about four times the apparent length of the comparatively thick, much curved, light horn-colored claws, as held when walking; these slender, almost hair-like appendages or fingers are smooth, slightly curved downward, not tapering to the extremity, terminates in an abrupt, complete globe of about two or three times the diameter of the pedicel. Antennæ long compared with those of the female, but moderate when compared with those of some Aphidæ; pale whitish-yellow, inserted before the eyes, they usually appear three-jointed, (and will be thus considered when examining with a good pocket lens, and more especially in the dried specimen, where we have not the advantages of motion under the microscope, so invaluable in the living specimen.) The extreme joint being very long, and under a higher power annulated with about 25 fine grooves, the marks of the primary rings; but in

the discoidal is so very obscure as to be easily overlooked, and, being a microscopic character, might be rejected, but if retained we still have the generic characters differing from *Dactylosphæra*, viz.: Anterior wing with one one-branched discoidal. Antennæ 3—8 joints. Tarsi *two* digituli. In case, however, the characters given above should be sufficient to separate, generically, *vitifoliæ* from *D. globosum*, I would propose the generic name of *Viteus* for the former.

† I wish to be clearly understood regarding what I saw of these wing characters. Very probably they will not all be admitted as existing characters by closet investigation of the dry specimen. My examinations were all made in the recent state. With a good lens the discoidal nerve can be seen not as a clear, sharply defined rib, but as an obscure, hazy, margined line; the same may be said of the subcostal nerve which, however, is much plainer, the discoidal branch not observable.

With a good compound microscope, of different increasing powers, something more can be learned in the *recent* state. All the veins are in an imperfect or partially developed state; the walls of the tubes are not so completely formed as to present the sharply defined lines observable in higher developed insects, and with sufficient power to discover the primitive cells, we behold them piled up on each other—great blocks of microscopic masonry—the foundations of the walls of the veins. Looking through the centre of the forming tube, the field appears more transparent, because we do not look through so great a depth of the imperfect tube walls as at the side; this central transparency of these hazy lines in the wing is, furthermore, an evidence that it is a channel for the circulation of the blood. The margins and terminations of these veins appear hazy because the cells are in a loose or diffuse state. In most insects the walls of the veins are completed, hence the ribs are clearly defined. These remarks are peculiarly adapted to the *discoidal* nervure, where the cells that nature has provided for the construction of the tube of the vein are to be seen to good advantage between the membranes of the wing. The branch of the discoidal is a very slender capillary tube, with similarly imperfect walls. I saw in one wing a faint trace of a capillary stigmatic nervure in a small part of its course. The subcostal nerve of the posterior wing is in the same undeveloped condition and almost capillary—microscopic. I examined, thus, every portion of the wings of my specimens, elsewhere I saw no trace of nerves, only the uniform

one specimen I fairly succeeded in resolving this extremity into five joints, making in all really seven joints somewhat nearly equal; first joint tumid, very short; second short and thick also, but much smaller than the first, truncately rounded at the outer end, with a somewhat prominent spine projecting from the anterior margin and a solitary capillary hair of equal length; third connected with the second by a narrow pedicel; fourth slender, small: thence the joints become gradually thicker towards the last; fifth longest, about equal to the third with its pedicel; sixth shortest excepting the basal; seventh becoming obliquely tapering towards the apex, which sustains three short spines. The pedicel, between the second and third, may be a very small joint, (of which I am convinced, giving really 8 joints in all,) but of its existence I am not certain by ocular demonstration, therefore I do not give it place as a positive character. The numerous grooves in the antennæ much resemble the line of union of very short closely embracing segments soldered together, and are doubtless primary rings of embryonic development. Length to the tip of the wings about ·07 inch.

Female yellow, tumid; abdomen gradually tapering to a short point: clumsy, making little or no progress on a smooth surface, somewhat variable in size, appearing, to the naked eye, not much unlike a yellow immature grain of common purslane (*Portulàca oleracea*, L.) seed. Like the *Termite*, increasing in size and fertility as pregnancy continues; its average length being somewhere about three-hundredths of an inch; segments more conspicuous above and beneath than on the sides; the globular-ended, or knobbed hair-like digituli of the tarsi plainly seen projecting beyond all the feet about half their length, fornicate cylindraceous; also on each side of these, there is a prominent, accuminate, hair-like spine, and between them a short spine of about, or somewhat less than, half their length. Antennæ 3-jointed, transversely rugose or imperfectly annulose, nearly naked, sublinear, situated on the forehead in front of the eyes; first segment tumid or subglobose, short, of much the greatest diameter; second short, intermediate in diameter between the first and third, with a small spine anteriorly; third exceeding the first and second in length, subfusiform, the obliquely pointed apex shortly bifid; eyes small, few facets. Promuscis arising from about the anterior fifth, in a thick reclining stump-like base; sheath three-jointed (?), usually lying on the breast.

Larva somewhat depressed, elongate-elliptical, in the field of view from above; moderately active, yet slow when compared with other insects; in the field of a microscope of low power it can be examined with a good degree of satisfaction before it travels beyond the field of view; color light yellow-prasinous; feet and antennæ as in the perfect female.

Egg prolate spheroidal; length about 2½ times the width; pale greenish-white; to the naked eye visible only as a fine dust point.

Pupa of the male somewhat longer and more slender than the mature female, browner; legs longer, much more active; the short, brown, imperfect wings diverging obliquely down the sides; antennæ as in the mature female.

Gall.—The *vitifoliæ* gall always opens on the *upper* side of the leaf, while the gall of *Dactylosphæra globosum*, on the leaf of the Pig-Nut Hickory, (*Carya glabra*), always opens on the *lower* side, and both are alike in being free from any of the sugary dust, so common among the gall-producing *Aphidæ*. It is subglobular, quite rough on the outside, and of variable size, according to the age, &c., well developed galls attaining the size of a pea. They are often very numerous, almost covering the leaf, and in many cases the leaf is destroyed before the gall becomes fully developed; occasionally they are located on the

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thin celiular tissue connecting the two walls of the wing-bag. These are facts that I believe worth recording; others may receive them for what they are worth in classification. I can see here somewhat satisfactorily the same plan of neuration, in an embryonic state, as given for the genus *Dactylosphæra*, and I will not be surprised if specimens yet be found in a better state of development. The wing neuration of *Dactylosphæra* is synonymous with that of *Phylloxera*, (Proc. Ent. Society, vol. i., p. 297, fig. 8,) it is therefore upon the other characters that I found this genus.

leaf stalks, tendrils and vine itself; these latter some authors are inclined to refer to a distinct species, but as they are associated with those on the leaf, and as there is no observable anatomical difference between the egg, larva and female of these and those on the leaf (as I have shown elsewhere), it is quite inconsistent to believe that there is a specific difference. The young larva leaves the gall, usually, soon after being hatched and resorts to the tender leaf as it is expanding from the bud, fixes its location, where it feeds by puncturing the leaf and sucking the juices; this irritation causes an abnormal development of the leaf and thus produces a cup or bottle-like excrescence or gall in which the insect now developes to a mother and where she resides, laying eggs, during the remainder of her life; from 50 up to even 5000 eggs may be found with her at once, and one female may be the progenitor of many millions in one season, even 10,000,000,000,000,000, as I have shown in the *Practical Entomologist*, vol. 2, page 17. Sometimes a few of the female larvæ, from some cause, appear to remain in the gall until maturity;* at other times the galls are so closely located that two or three are blended into one irregular gall, with as many primary parents. This disposition to, in a measure, form colonies, while the coccus spirit of emigration also prevails, is another evidence that this insect forms the connecting link between the *Aphidæ* and *Coccidæ*. Much might be said regarding these galls, their enemies, &c., but they have been in a measure recorded in various publications.

HOW TO CONDUCT EXAMINATIONS.

The antennæ of these insects can easily be examined with a common botanical microscope, as I have often done; for this purpose the young larva is as good or perhaps better than an old female, but it travels so rapidly that it is impossible to keep it long enough in the field of a *good* microscope to make a satisfactory examination of the feet—the all-important organs in family classification here; and if on the back the incessant motion of the legs, sweeping through the field of vision so rapidly, gives a very poor and unsatisfactory view. But for a thorough examination I must insist on putting the living insect under a good microscope, and although the pregnant female is a clumsy, globular looking mass, with the legs apparently so close on the body as to be nearly out of view, yet I find it the best state for examination, and it will lie on its belly, side or back, as we may place it, long enough to examine it carefully, especially when pretty cool; if we place it on the side or back we can get a very good view of the feet, and we can see to good advantage the digituli, curved from above downward, and also the movement control that the insect has over them, diverging, approximating, elevating and depressing them; under a poor glass these will be mistaken for long slender claws, but the true claws will be seen just beneath them, and when on the back or side with the leg projecting out leisurely from the body or sweeping through the field of vision, I have watched them for many hours without being able to solve the problem of one or two claws, so close does the insect keep them when they are curved in under the foot, as they always are when in these positions. But place it on its belly on the smooth glass plate, and it vainly struggles without being able to move from the spot; it thrusts out its legs, and, as might be supposed, naturally enough spreads every organ of the feet, over which it has muscular control, to aid locomotion; looking from above downward we see the long hair-like digituli, with their globular ends, sweeping over the glass plate; the globe not becoming distorted or brushed off, we are convinced that it is not a

* I would here raise the inquiry, inasmuch as *winged* males are so very rare, may not some of these supposed females be apterous males, especially in those perfectly round galls, apparently made by one mother, wherein we often find several apterous female like imago, usually somewhat smaller than the one original parent of the colony? Otherwise, how can we account for the fertilization of the eggs that are to pass the winter? *Winged* males certainly, on account of their extreme rarity, do not fertilize many; yet from appearances, their numerous enemies, their great liability to destruction from every cause, and with all their great abundance, many certainly must become fertilized from some source. This is a point yet open for investigation.

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liquid exudation, but a true solid member of the body; its hair-like pedicel may be seen occasionally to bend, thus proving its pliability; the pedicels, as well as the globes, are translucent, and without doubt are composed of the same leathery structure as other parts of the skeleton, and in the cast skin they appear as perfect as in the living animal; these are remarkable appendages, entirely unlike anything which we ordinarily see in the anatomy of insects. Burmeister, in his admirable *Manual of Entomology*, so far as I at present have it in remembrance from thorough study some years ago, fails to observe anything of the kind, and I can only conjecture that their use is to enable this small insect to climb with safety over the down of the tender grape leaf, with which it is abundantly supplied, when the down and hairs are so long as to prevent the ungues from reaching the bark. This instrument is admirably adapted to lock firmly between the projecting hair and down of plants, and convey the insect through this forest of down with safety. The globe on the end may also possibly be a gland, secreting a viscid substance, but of this I have no ocular demonstration. On either side of these digituli we see a diverging spine nearly equalling them in length, and between them we see a short stub or spine-like body, less than half their length. I have not minutely examined this, having only seen it in the field from above; it may probably be the spurious claw—*pseudonychia* of Burmeister, or undeveloped digituli. Beneath these the claws, one on each side, can be plainly seen widely spreading on the smooth glass as the insect vainly struggles to move forward; these claws are much curved, short, and comparatively thick and strong, appearing light horn-colored under a good achromatic microscope.

With such an armor as this we cannot help viewing with admiration the wonderful adaptability of nature to the wants of so frail a creature; by the means of the four-fingered and two-clawed hand, as it were, alone, it can travel with as much safety from the parent gall, far below on the vine, up over the forests of down that it may encounter on the plant in its progress to the tender bud, as the monkey travels over the tops of the trees in the dense jungles of tropical climes; without these, amidst the atmospheric storms, it must fail to reach the tender bud, where alone it is able to construct a new gall and repeat the work of its parent and fulfil the unworthy object of its being.

While the insect is on its back, to examine the tarsi, promuscis, &c., you will not fail to observe the manual dexterity displayed as it seizes hold of the promuscis and setæ, with this hand-like organ, and pulls them away to one side as it struggles and kicks in the vain effort to right its position. Perfectly at home in the snug tenement—its gall—it is almost as unhappy on the hard smooth glass-plate of a microscope as a fish is on dry land, unwillingly a martyr to science.

To examine the nature of the articulations you will prefer a larva; they are very imperfect, appearing externally like a mere thinning of the leathery structure of its limbs, with no well-defined line of union between the tibia and tarsus; this dermal membrane about the joint wrinkles as it bends the organ in locomotion; the lower end of the tibia projects into a prominent heel on which it treads heavily.

I believe that the females are never winged in any season of the year, if they are in the spring they are not much used. I see here grapes, not more than one hundred yards from the vines, so completely covered with them, entirely free, and have thus remained during three summers, while another cluster of grapes taken in the early spring from among the affected ones and planted at some distance in another direction, are in like manner affected. This fact, in a measure, is confirmatory of my former conjecture, that these insects probably survive the winter in galls on the tendrils and vine stalk, or it may be occasionally that the egg, falling into small crevices in the old bark, thus passes through the winter. If there is any freezing of these eggs, the burying of the vine in the earth and snow affords them protection. Now, as the leaves are falling, many of the galls are full of eggs and very few of them are hatching, and with the

increasing coldness of autumn it will cease altogether; soon after falling the leaf dries and consequently the gall shrinks and gapes open; thus many of the eggs can fall out on the ground around the roots, and in this way chiefly do they survive the winter. In transplanting they are conveyed with the earth around the roots. In the early warm summer weather these eggs hatch and the young louse, instinctively, resorts to the vine and ascends to the leaf in quest of food. Thus they are perpetually preserved about the once affected vine and removed from place to place in transplanting.

Their natural enemies may hold them in check, but will never subdue them. When they become too numerous to obtain a sufficient supply of their insect-food readily everywhere they die of starvation, while some of these lice are still living in security enough to continue the species. Their enemies are numerous, and I never go forth to investigate, even now at the end of long years of study, without discovering something new and interesting. Their natural history is inexhaustible; insignificant as it may seem to be, it is an object of the deepest interest when we come to the examination with our eyes open to the truths that develop around us and force themselves upon our consideration.

The winged males are very rare, among the rarest of the rare, as I have found by experience, at least in this region. I have opened more than ten thousand galls and never saw but four winged imagos; one I found late in September of last year, and three during the present autumn; two were somewhat imperfect but useful material for examination; two I took from one gall a few days ago, one of them was entirely perfect, it was an admirable specimen for examination; it enabled me to get the precise position of the wings in repose. They are very liable to be crushed or injured in opening the galls, because it is necessary to open them rapidly to make any progress, and a very little water entering a gall causes the wings to adhere, frail membranes as they are, and greatly damages them. I also found three male pupæ and a parent female and eggs in a gall. I failed to raise either of these pupæ; they soon perished after the gall was removed from the vine, refusing to leave the old drying gall for fresh ones placed beside them.

Having thus found four male imagos and seen the pupa, there appears to be no further good reason why I should longer delay the publication of my supposed new genus and family and my observations, except that I wish to forward a supply of them to learned societies, but as they are so exceedingly rare it appears like hoping against hope.

As this is a very common insect it needs a common name, and I think no better could be given it than that suggested in the *Prairie Farmer*, (Aug. 4, 1866,)—"*Grape leaf louse.*"

Mount Carroll, Ills., Oct. 8, 1866.

NOTE.—My description and the details of my observations of these insects may appear quite prolix, but on account of the various erroneous opinions held by popular authors regarding them, I have been induced to give a pretty minute description of the insects in their *different* states, and the method of conducting my observations, so that others may the more readily verify them, from even larva and females, my only object being the development of truth.

Dr. Fitch locates them in the *Aphis* family, while Mr. Walsh classes them among the *Coccidæ;* they appear nearer the former than the latter. But the "grape leaf louse" certainly bears no generic resemblance to *Pemphigus* as Fitch declares, doubtless, without observation, which is hardly excusable in even the most popular writers.

For what reason, if any, Mr. Walsh could have announced, in the *Practical Entomologist*, vol. i., p. 111 and 112, that the *Vitifoliæ* gall "is the work of an insect, not of a plant-louse, however, as Dr. Fitch supposed, but as I have recently ascertained, of a true bark-louse belonging to the *Coccus* family;" and in further allusion to *his three gall-making bark-lice* unqualifiedly assures us that "any entomologist by examining either the *vitifoliæ* (insect) of Fitch, which I

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find on the wild *Vitis cordifolia* and on the tame Clinton grape-vine, or the gall *caryævenæ* of Fitch, which I find exclusively on the leaves of the Shellbark Hickory (*Carya alba*), and the third—an undescribed gall, the size of a cabbage seed, on the leaves of the Pig-nut Hickory (*Carya glabra*) may easily satisfy himself that the mother-louse inhabiting them does not belong to the *Aphis* but to the *Coccus* Family," &c., &c., *without telling us how to become satisfied that a plainly* two-*clawed tarsus belongs to the Coccus family*, is quite incomprehensible, and certainly utterly at variance with their true anatomical characters. My paper discusses two of these *supposed bark-lice*, and I believe that the third is of the same character. Dr. Fitch's "rashness" is here fairly paralleled by the accuser himself, in the same paper, by "fixing the *family* to which a particular larva belongs," as I have abundantly demonstrated. H. S.

Feb. 5th.

MR. VAUX, Vice-President, in the Chair.

Twenty seven members present.

Feb. 12th.

The President, DR. HAYS, in the Chair.

Thirty members present.

The death of R. Kennicott, member, was announced.

Feb. 19th.

The President, DR. HAYS, in the Chair.

Forty-four members present.

The following papers were presented for publication:

"A list of introduced plants, growing in waste ground below the Philadelphia Navy Yard, &c." By Aubrey H. Smith.

"On the Habits of the Cutting Ant of Texas." By G. Lincecum.

The following deaths were announced:

William Norris, a member, on the 5th of January; Brackenridge Clemens, M. D., of Easton, Pa., a correspondent; Prof. Alexander Dallas Bache, a member, at Newport, R. I., on the 17th inst.

Dr. H. Allen directed the attention of the members to some features of interest in the conformation of the mammalian skull, based upon examinations of specimens in the Academy's collection.

Having noticed in the skull of a Kronian negro, in the Wistar and Horner Museum of the University of Pennsylvania, the absence of union between the greater wing of the sphenoid bone (alisphenoid) and anterior inferior angle of the parietal bone, and in its stead a union at that point between the temporal and frontal bones, he was desirous of ascertaining to what extent the variation would be found present in a series of crania. With this object examinations of the human skulls, eleven hundred in number, were made, when the variety was found present in twenty three. With these it was thought to be the result of deficient developement of the great wing of the sphenoid bone, an interspace being left which was occupied by a process of the temporal sent forwards and upwards to articulate with the frontal bone.

This was rendered probable from the occasional occurrence of Wormian bones near the site of union. In five specimens out of the twenty-three Wormian bones were found placed between the squamo-parietal and squamo-frontal sutures, but more often in the former locality, when they were often associated with similar bones situated at the temporo-occipital region. The extent of the suture was subject to much variation; in some specimens it was an inch long and well marked, in others it was reduced to a mere point. In three specimens it was found on one side, the spheno-parietal being present on the other. In yet another the temporo-frontal was seen on one side and the spheno-parietal with Wormian bones on the other.

The whole number of specimens was distributed among the varieties of men as follows:

Anglo-Saxon, Pelasgic, Swede, Chinese, Hindu, Bengalese, Mandan, Seminole Indian, Blackfoot Indian, Iroquois, and Esquimaux, each one. The remaining twelve were negro.

This observation lead to the examination of the skulls of the mammalia, the result being as follows:

Spheno-parietal suture.	*Temporo-frontal suture.*
Simia morio,	Troglodytes niger,
Simia satyrus, ex,	Hylobates,
Semnopithecus,	Cercopithecus, ex,
CATARRHINI,	PLATTYRRHINI,
LEMURIDÆ,	Bison,
MARSUPIALIA,	Bos,
CARNIVORA,	Tragus,
CETACEA,	Tapirus,
SIRENIA,	Rhinoceros,
RUMINANTIA, ex.	Sus,
Chœropsis,	Equus,
Hyrax,	RODENTIA,
Dicotyles.	EDENTATA,
Troglodytes gorilla,	Hypsiprymnus.

In the anthropoid apes it was found that the temporo-frontal suture was constant in the skull of all the species excepting *S. morio* and one specimen of *S. satyrus*. Prof. Owen* mentions the spheno parietal articulation in *S. satyrus*, and considers it a distinctive character of Simia; but in the skull of a young individual examined, the suture was indubitably temporo frontal. Out of seventeen specimens of Cercopithecus in the collection seven had the spheno-parietal articulation. In two of these it was spheno-parietal on one side, temporo-frontal on the other.

In the Ruminantia the alisphenoid was very slightly developed, the union being effected by the external angular process of the parietal growing downwards in a long falciform extension. This was seen to be a conspicuous feature in the skulls of this order. The variation noticed in Bison, Bos and Tragus, had its origin in the first two genera in the unusual development of the frontal bone backwards and outwards, reaching the temporal bone by cutting off, as it were, the descending process of the parietal. In the last, one specimen only was examined; the spheno-parietal union was complete on one side, while the temporo-frontal was but faintly determined on the other. It was thought probable that the skulls of young individuals of these genera would show upon examination the same plan of construction in this particular as others of the order.

The suture was seen to be invariable in Carnivora, Cetacea, Sirenia, Edentata and Rodentia; but inconstant among the members of Marsupialia and the Cuvierian order Pachydermata. Among the marked contrasts here observed were those between Sus and Dicotyles, Hyrax and Rhinoceros.

* Trans. Zool. Soc., vol. i., 1835, 368.

From the early obliteration of all cranial sutures in Cheiroptera and Insectivora—many young individuals of the former order were examined—nothing definite was ascertained concerning them. It is reasonable to suppose that they resemble the Carnivora.

Dr. Allen further spoke of a distinguishing feature between the skulls of the new and old world monkeys. In the former there is no bony external meatus; in the latter there is a well defined osseous tube as in man. He also invited attention to an interesting feature in the skull of a young Chimpanzee, in which it was found that the lachyrmal and ethmoid bones were separated from one another by an ascending process of the orbital plate of the superior maxilla, which articulated with the internal angular process of the frontal bone. The peculiarity had not been seen in any ape, though a human skull in the collection (Esquimaux) exhibited it.

It was thought that the subject of sutures was of interest from an anatomical stand-point and might, after more extended comparison, prove of value in classification.

A letter was read from Dr. Charles M. Wetherill as follows:

Bethlehem, Pa., Feb. 16th, 1867.

WM. S. VAUX, ESQ.:

Dear Sir,—Will you do me the favor to communicate to the Academy the following results, which I have reached in an investigation (not yet completed) upon the Itacolumite.

The so-called flexible character of this sandstone is universally attributed to the mica which it contains. I have succeeded, beyond a doubt, in establishing the fact that the said motion is due to innumerable ball and socket joints. This wonderful molecular grouping warrants, I think, the suggestion of "*articulites*" as a generic name for this class of sandstones. I succeeded in first observing the play of these joints upon their sections under the microscope, taken in three planes relative to the plane of stratification. It is, however, unnecessary to incur the labor of preparing such sections; the motion may be perceived with any fragment by examination with the microscope, moving the loose particles in the joints with the needle point, or removing the said particles, thus dissecting the specimens.

The joints are not similar to those observed in columns of basalt. The fragments of quartz are very small and very sharp; twenty, thirty or more of these sand particles are cemented to each other to form irregular compound molecules. The protuberances of these are engaged in the cavities of neighboring groups, and so irregular and abundant is the jointing, that a slight motion is permitted in any direction.

A long thin rod of the sandstone may be twisted, elongated, compressed longitudinally, or bent nearly equally in any direction. When suspended by its extremities, the rod takes the form of a curve which very nearly approaches a true catenary. My friend and colleague, Prof. E. W. Morgan, of the Lehigh University, is, at my request, studying the exact nature of the curve thus formed.

The specimens examined are from two localities; from Mines Geraes in Brazil, a specimen in the collection of the Smithsonian Institution; and another from Stokes Co., N. C. An analysis of the latter showed a large proportion of silicic acid, and the cement, if it be one, which unites the grains of sand, is not ferruginous, as was shown by boiling a thin section, during a considerable period, with hydrochloric acid.

I would be very much obliged to you (or to any member of the Academy,) if you would furnish me with specimens of Itacolumite from different localities for this investigation.

I have thought that the establishment of the curious molecular character of this mineral might lead to a knowledge of the physical conditions by which it was effected and perhaps throw light upon that vexed question, the origin of the diamond.

Very truly yours,

CHARLES M. WETHERILL.

Feb. 26th.

The President, DR. HAYS, in the Chair.

Thirty-eight members present.

The resignation of Dr. H. C. Wood as Recording Secretary was accepted.

Joseph Jeanes tendered his resignation as Corresponding Secretary, which was accepted.

Resignations of membership were tendered by James Starr and J. Heintzleman, and were accepted.

A communication was received announcing the organization of the Conchological Section of the Academy, and the election of its officers.

Dr. Harrison Allen was elected Corresponding Secretary of the Academy for the remainder of the year, and Dr. S. B. Howell, Recording Secretary, for the same period.

The following were elected members:

Evan Randolph, Francis R. Cope, Joseph Patterson, Richard M. Marshall, Benjamin Marshall, John Livezey, Charles H. Borie, Thomas P. Cope, Miss R. A. Cope, Mrs. E. H. Vaux, Joseph S. Lovering, Jr., Samuel P. Carpenter, Richard R. Robb, William Hacker, Stephen Colwell, Miss Ann Haines, Miss Jane R. Haines, F. L. Bodine, Horace M. Bellows, M. D., John G. Stetler, M. D., William Procter, Jr., and Anthony Heger, M. D., U. S. A.

The election for Standing Committees, deferred from the last business meeting, was held with the following result:

ETHNOLOGY.

J. AITKEN MEIGS,
S. S. HALDEMAN,
F. V. HAYDEN.

BOTANY.

ELIAS DURAND,
AUBREY H. SMITH,
H. C. WOOD, JR.

COMP. ANAT. AND GEN. ZOOLOGY.

JOSEPH LEIDY,
HARRISON ALLEN,
S. B. HOWELL.

MINERALOGY.

WILLIAM S. VAUX,
S. R. ROBERTS,
ALBERT LEEDS.

MAMMALOGY.

J. H. SLACK,
E. D. COPE,
HARRISON ALLEN.

GEOLOGY.

ISAAC LEA,
F. V. HAYDEN,
T. A. CONRAD.

ORNITHOLOGY.

JOHN CASSIN,
SPENCER F. BAIRD,
B. A. HOOPES.

PALÆONTOLOGY.

T. A. CONRAD,
JOSEPH LEIDY,
F. V. HAYDEN.

HERPETOLOGY AND ICHTHYOLOGY.

EDWARD D. COPE,
S. WEIR MITCHELL,
CHARLES SHAEFFER.

PHYSICS.

ROBERT BRIDGES,
ROBERT E. ROGERS,
JACOB ENNIS.

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CONCHOLOGY.

GEORGE W. TRYON, JR.,
E. R. BEADLE,
C. F. PARKER.

ENTOMOLOGY AND CRUSTACEA.

JOHN L. LE CONTE,
J. H. B. BLAND,
TRYON REAKIRT.

LIBRARY.

JOSEPH LEIDY,
JOHN CASSIN,
ROBERT BRIDGES.

PROCEEDINGS.

JOSEPH LEIDY,
WILLIAM S. VAUX,
JOHN CASSIN,
ROBERT BRIDGES,
GEORGE W. TRYON, JR.

On favorable report of the respective committees, the following were ordered to be published:

On Colonies of PLANTS observed near Philadelphia.

BY AUBREY H. SMITH.

During the years 1864, 1865 and 1866, a large number of introduced plants, chiefly southern, were found growing on the waste grounds below the Philadelphia Navy Yard, and at Kaighn's Point and Petty's Island, on the opposite shore of the Delaware.

It has been thought by those who were engaged in the work of collection, that some account of these localities and a list of the plants themselves should be placed at the command of students investigating the subject of the introduction and naturalization of plants. To meet this view I have prepared the following pages.

The city of Philadelphia is built on a low gravelly bluff, extending along the right bank of the Delaware with little interruption from Kensington on the north to the Navy Yard on the south. It is scarcely practicable now to define accurately the limits of this bluff, but it may be stated, in general terms, that above Kensington and below the Navy Yard, it recedes from the river, and its place is supplied by tide marshes to a greater or less extent. Northward these marshes have been largely filled up and built upon, but southward the low margin of the river has been but partially reclaimed.

Immediately below the Navy Yard, the rim of tide marsh does not exceed two or three hundred yards in width. Further down the river it widens greatly, and has been banked in for agricultural and grazing purposes. Between the Navy Yard and the banked meadows, the tide flats have awaited the slow demands of commerce for their utilization.

The first step to the reclamation of the flats is the extension of the lines of the eastern streets to the line of low tide, and the building of bulk-heads of logs at their extremities below low water mark. The streets thus extended are filled up with waste earth from cellars and similar excavations, and thus causeways are made out to the bulk-heads. Next, the bulk-heads themselves are extended right and left to meet similar works from the ends of other streets. The wharf line thus built is then conveniently secured by the deposit behind it of sand and gravel ballast from coasting vessels, as well as of earth brought specially for the purpose. Behind it, there will, of course, exist a pond or lagoon, to be filled up from time to time, from the river or from the land, as materials may offer themselves on either side of it.

From Dickerson Street northward to the Navy Yard, the flats have been entirely reclaimed, and coal wharves and ship yards occupy their place. Southward of this street, at the distance of six or seven hundred feet, an earthen embankment extends Morris Street to the line of low water, and a bulk-head

carried to the left connects this causeway with the reclaimed land at Dickerson Street. A pond, not now of more than three acres in extent, lies behind the bulk-head, and communicates with the river by a covered sluice, through which the tide ebbs and flows. Between the pond and the river are some two acres of ground made by the deposit there, through many years, of sand and gravel ballast from the coasters, and of mud from the cleansing of the docks of the city. On the west and north the pond is rapidly diminishing in size, as waste materials from the city are cast into it, and in a few years it will no doubt wholly disappear. The marshes formerly existing above Dickerson Street have been reclaimed by the same process, and those below Morris Street will in time be dealt with in a similar manner. Upon the reclaimed land behind the bulk-head between Dickerson and Morris Streets have been found the greater part of the plants enumerated in this list. This locality, which for convenience we have called the Ballast Ground, did not exist fifteen years ago, for the bulk-head which protects it from the river has itself been built within that period. Some of the plants may, however, have existed in similar places along the river for a long time. Muhlenberg, in his catalogue published in 1813, mentions *Senebiera didyma* and *Cynodon Dactylon* as plants of Pennsylvania, though since his day they have only been found, so far as I have learned, at or near this place. *Salsola Kali* is not rare in the waste grounds about Philadelphia, and *Atriplex hastata*, its maritime congener, is abundant in every neglected out-lot. *Pluchea camphorata* and *Aster linifolius* are firmly established in a pool, at the foot of Tasker Street, not connected with the pond behind the Ballast Ground and probably of much older date and different origin, whilst *Artemisia biennis* is abundant in by-places for half a mile about.

The unenclosed grounds below the Navy Yard are in some respects very favorably situated for the growth of southern plants. The trend of the river shore being south by west, the whole width of the city spreads between them and the quarters from which the colder winds blow. Those of the north and north-west must pass before reaching the Navy Yard for four or five miles over houses and factories, the innumerable fires of which will at all times temper their rigor, whilst the easterly, southerly and south-westerly winds are made yet milder by the wide expanse of water over which they come. The ground too being at the level of tide offers the most favorable conditions, so far as elevation is concerned.

I regret that it has not been in my power to obtain thermometrical observations from which a comparison might be made of the average temperatures, at different seasons, of several points in a line running north-westwardly from the Navy Yard to Girard College. From these we could learn whether or not the causes I have indicated are able to produce sensible effects on the vegetation at the margin of the river. Those at Girard College are all that are needed for that station, but, there being no intermediate ones, they are of no avail for the present purpose.

Nearly opposite the Ballast Ground, on the New Jersey side of the river at Kaighn's Point, is a large enclosed ship and timber yard, which presents conditions somewhat similar to those of the locality just described. A portion of the low ground at this place has been filled in and levelled out to the wharves and bulk-heads, whilst another part of it remains nearly in its natural state. From this enclosure come the most of the plants attributed in this list to Kaighn's Point, though a few of them have been found without its limits.

Petty's Island is a tract of reclaimed alluvion on the New Jersey side of the Delaware, opposite the mouth of Cooper's Creek, which has been, to some extent, used of late years as a place of deposit for ballast, sand and other waste and rough material. It was not known as a botanical locality of interest until visited during the present year (1866) by Mr. Isaac Burk. Since his discovery of it, however, it has been constantly and carefully watched by him and other botanists, and the results of their observations are to be found herein.

Both Kaighn's Point and Petty's Island share the advantages for the growth

and naturalization of the plants of warmer climates which have been ascribed to the Ballast Ground. Sheltered by the wide sweep of the city crescent from the colder winds, they lie at the level of tide with the broad expanse of the river, further to temper the atmosphere which reaches them.

I have been thus minute in the description of these localities, in order not only that the circumstances under which these curious colonies of strangers have taken up their abode with us may be understood, but, in the anticipation of their speedy destruction as the city extends its limits, and of the establishment of similar ones elsewhere on its outskirts, that those who shall observe such future settlements may have the means of tracing their history and development.

The Ballast Ground locality was discovered by Messrs. Diffenbaugh and Parker in the latter part of the season of 1864; that at Kaighn's Point was made known about the same time by the last named gentleman. Since then the plants of those places, and in 1866 those of Petty's Island, have been carefully watched and collected by a number of botanists. Among these I may especially mention Dr. Martindale and Messrs. Burk, Diffenbaugh and Parker, to each of whom I am indebted for some of the rarest in the list.

All the plants have been submitted to Prof. T. C. Porter, and the determinations in all cases of difficulty have his full concurrence. Dr. Porter himself shared the work of collection.

It will be observed in many instances that the fruit has not matured, and in some that not even the flower has appeared. This may not always have been due to the shortness of the season, but sometimes to the late deposit of the sand or gravel with which the seeds have been brought from the south.

A small number of the plants of 1864 did not re-appear in 1865, and some of those of 1865 were not found in 1866. One or two of them, threatened by the frost before flowering or fruiting, were transplanted, and developed their characters under glass. For this service we are indebted to Mr. Kilvington and Dr. Leidy.

Many plants were found growing with those enumerated in the list, which are regarded as introduced, but which are not strictly confined to the localities above described. Some of these are rare and of limited distribution. Nevertheless, but few of them have been included herein, inasmuch as this list is intended, in the main, to contain the names only of those which have not hitherto been collected in the neighborhood of Philadelphia. At a subsequent period, a supplemental catalogue may be given of such of these as shall be deemed of interest.

This list exhibits, as nearly as my information enables me to give it, the actual state of the adventive flora of the several localities in each of the years of collection; but it is proper to say that the time which has elapsed since their discovery has been too short to justify any positive assertion as to the completeness of the catalogue, or the appearance or disappearance of any of the plants named in it.

1. Erysimum orientale, *R. Br.* (*Brassica orientalis*, L.) Three specimens collected at Kaighn's Point in 1866. Fruit perfected. Adv. from Europe, where it is widely distributed.

2. Sinapis alba, *L.* A single plant, collected on the waste grounds northwest of the Ballast Ground by Mr. Diffenbaugh, on the 17th June, 1865. Fruit perfected. Adv. from Europe.

3. Senebiera didyma, *Pers.* Ballast Ground and Kaighn's Point, Sept. and Oct., 1864, 1865, 1866. Abundant and in mature fruit—rather less common in the latter year. *Hab.*—North Carolina to Florida; Chapman. Also waste places at ports, &c., Virginia to Carolina—an immigrant from farther south; Gray.

4. Senebiera Coronopus, *Poir.* A single specimen collected on the Ballast Ground by Mr. Burke in 1865. Adv. from Europe.

5. Cakile Americana, *Nutt.* Ballast Ground, Sept. and Oct, 1864, 1865. Very few specimens. *Hab.*—Sea coast and Great Lakes; Gray.

6. Sagina subulata, *Torr & Gray.* (*S. Elliottii*, Fenzl.; *Spergula subulata*, Swartz).
Ballast Ground, 1865, 1866. Less frequent in the latter year. Fruit perfected in both seasons. These specimens, and others apparently of the same species from Charleston, S. C., are glandular hairy on the peduncles and calyx,—not smooth, as in S. Elliottii, according to Chapman.
In the spring of 1865, Mr. Charles E. Smith collected at Somer's Point, N. J., a slender form of S. subulata, which Dr. Gray regards as a variety, and has called, from the discoverer, var. Smithii. Dr. Gray now considers S. Elliottii not distinguishable from S. subulata.

7. Sesuvium Portulacastrum, *L.* Two small patches near the southern end of the Ballast Ground, 1865. Fruit matured. *Hab.*—Sea coast of New Jersey and Southward; Gray.

8. Sesuvium pentandrum, *Ell.* Petty's Island, 1866. Not frequent; fruit perfected. *Hab.*—Sea coast, North Carolina to Florida; Chapman.

9. Portulaca pilosa, *L.* Petty's Island, 1866. Infrequent and with fruit not fully developed. *Hab.*—Key West, Florida; Chapman.

10. Malvastrum tricuspidatum, *Gray.* Pl. Wright, Pt. I., p. 16. (M. carpinifolium, *Gray.* Pl. Fendl., p. 22.) Two specimens with imperfected fruit collected by Mr. Burk and Diffenbaugh, on the Ballast Ground, in 1865. Dr. Porter has two specimens from the same locality with perfected fruit. This plant is probably the Malva Americana of Muhlenberg's Catalogue, p. 62, where it is recorded as growing in Pennsylvania. *Hab.*—South Florida; Chapman.

11. Sida stipulata, *Cav.* A considerable number of plants scattered over the Ballast Ground, Sept. and Oct., 1864, 1865. In flower and with fruit nearly perfected. *Hab.*—Waste places about dwellings—Florida. According to DC., this plant has naturalized itself in many parts of the world.

12. Modiola multifida, *Moench.* Appeared in leaf only on the Ballast Ground late in the autumn of 1865. It was transplanted by Mr. Kilvington, and, placed under glass, produced its flowers and fruit in April, 1866. *Hab.*—North Carolina to Florida; Chapman.

13. Kosteletzkya Virginica, *Presl.* A few specimens collected on the eastern margin of the pond, but none with mature fruit. Sept. and Oct., 1865. Also at Kaighn's Point in the same year. *Hab.*—Marshes along the sea coast, from Long Island southward; Gray.

14. Gossypium herbaceum, *L.* Eastern and western margins of the pond. Oct., 1865, 1866. Flowers in both seasons, but no fruit.

15. Trifolium Carolinianum, *Mx.* Ballast Ground, 1865. Abundant and with perfect fruit Less frequent in 1866. Two specimens at Kaighn's Point in the latter year. *Hab.*—North Carolina to Florida; Chapman.

16. Melilotus parviflora, *Desf.* (*M. occidentalis*, Nutt.) Ballast Ground and Kaighn's Point, 1865, 1866. Abundant and with mature fruit in both seasons. Adv. from Europe into Western Texas and Mexico. (U. S. Boundary Survey, Emory, Vol. II., p. 55.)

17. Medicago maculata, *Willd.* Ballast Ground, collected Oct. 14, 1866. Two specimens without flower or fruit. Adv. from Europe.

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18. Medicago denticulata, *Willd.* Ballast Ground, 1865, 1866. Rare, fruit perfected, more frequent in the latter year. Adv. from Europe.

19. Glottidium Floridanum, *DC.* A single plant collected on the Ballast Ground, but more frequent at Kaighn's Point. Sept. and Oct., 1865. One specimen at Petty's Island, Sept., 1866. Fruit not matured in any case. *Hab.*—South Carolina to Florida; Chapman.

20. Sesbania macrocarpa, *Muhl.* Ballast Ground, Sept. and Oct., 1865. Many specimens in full flower, but without perfect fruit. This plant and Glottidium Floridanum flowered about the 1st October, and were killed by the frost before their fruit was matured. *Hab.*—South Carolina to Florida; Chapman.

21. Ervum Lens, *L.* Federal Street wharf, Camden. Collected by Mr. Diffenbaugh, August 6th, 1865. Rare. Adv. from Europe.

22. Vigna glabra, *Savi.* Ballast Ground and Kaighn's Point, Sept. and Oct., 1865, 1866. Abundant in both places, but not perfecting its fruit. *Hab.*—Brackish marshes, from Florida to South Carolina; Chapman.

23. Cassia obtusifolia, *L.* Ballast Ground and Kaighn's Point, Sept. and Oct., 1865, 1866. A few flowering plants, but the fruit not matured. *Hab.*—North Carolina to Florida; Chapman.

24. Potentilla argentea, *L.* Collected at Kaighn's Point by Mr. Parker, June 4, 1865, with ripe fruit. Also at the Ballast Ground in 1865 and 1866. This plant has been observed in previous years near Red Bank, N. J. *Hab.*—Dry barren fields northward; Gray.

25. Potentilla anserina, *L.* Ballast Ground, 1865. A single specimen collected in flower by Mr. Diffenbaugh. *Hab.*—Brackish marshes and river banks, chiefly northward; Gray.

26. Ammania latifolia, *L.* Two specimens collected near the eastern margin of the pond by Mr. Diffenbaugh, Sept. 8, 1865. Fruit not matured. Two from the same place by Mr. Burk in 1866, with perfect fruit. It was also collected by Mr. Parker at Kaighn's Point, in 1866, in good fruit. *Hab.*—Ohio, Illinois, and southward; Gray.

27. Œnothera sinuata, *L.*, var. humifusa, *Torr* and *Gray.* Sparingly distributed on the Ballast Ground, Sept., 1866. *Hab.*—Drifting sands along the coast; Chapman.

28. Gaura sinuata, *Nutt.?* Collected on the Ballast Ground by Mr. Parker, Sept. 30, 1864. Fruit scarcely matured.

29. Jussiæa repens, *L.* Along the margin of the pond in several places; also at Kaighn's Point, 1864, 1865. In flower and with matured fruit. Kaighn's Point, 1866. Fruit perfected. Also at Petty's Island, 1866, but rare. Fruit perfected. *Hab.*—In water, Illinois, Kentucky and southward; Gray.

30. Jussiæa leptocarpa, *Nutt.* Along the margin of the pond, 1865. Several specimens, but the fruit not matured. *Hab.*—In marshes, Florida, and westward; Chapman.

31. Jussiæa decurrens, *DC.* Ballast Ground, 1865. Rare. *Hab.*—Ditches, Florida to North Carolina, and westward; Chapman.

32. Leptocaulis divaricatus, *DC.* Ballast Ground, 1865. Several specimens with perfected fruit. Kaighn's Point, 1866. Two specimens. *Hab.*—Sandy soil, North Carolina to Florida; Chapman.

33. Asperula arvensis, *L.* Ballast Ground, 1866. A single plant collected in flower, by Mr. Burk. Adv. from Europe.

34. Galium tricorne, *Host.* Ballast Ground, 1866. Collected by Mr. Burk. Larger than the European form. Adv. from Europe.

35. Diodia Virginica, *L.* Ballast Ground, 1865. Abundant and in perfect fruit. *Hab.*—Virginia and southward; Gray.

36. Oldenlandia glomerata, *Mx.* A single specimen from the Ballast Ground, but more frequent at Kaighn's Point. *Hab.*—Western Pennsylvania to Illinois, and southward; Gray.

37. Polypremum procumbens, *L.* Ballast Ground, Sept. and Oct., 1864 and 1865. Kaighn's Point, 1865, 1866. Abundant, fruit perfected. *Hab.*—Sandy fields, Virginia and southward; Chapman.

38. Eupatorium fœniculaceum, *Willd.* Growing freely on both sides of the river, Sept. and Oct., 1864, 1865. Scarcely so abundant in 1866. Fruit not matured in either season. *Hab.*—Virginia, near the coast and southward; Gray.

39. Eupatorium serotinum, *Mx.* At the eastern edge of the pond, Sept. 30, 1865. Fruit not matured. Also at Petty's Island, Sept., 1866, in flower only. *Hab.*—Illinois and southward; Gray.

40. Aster linifolius, *L.* At the foot of Tasker Street, in a pool west of and not connected with the main pond. Abundant and in perfect fruit., Oct., 1864, 1865, 1866. *Hab.*—Salt marshes, Maine to Virginia; Gray.

41. Solidago sempervirens, *L.* Eastern margin of the pond, Oct., 1865. More abundant in 1866 at the same place. Fruit matured in both years. *Hab.*—Salt marshes, Maine to Virginia; Gray.

42. Hetherotheca scabra, *DC.* Abundant on both sides of the river in Sept. and Oct., 1864, 1865, and 1866. Fruit matured. Rather less plentiful in 1866 than in the former years. *Hab.*—Sandy places along the coast of South Carolina and westward; Chapman.

43. Pluchea camphorata, *DC.* In the pool at the foot of Tasker Street, and at Kaighn's Point, Sept. and Oct., 1864, 1865, 1866. Also along the eastern margin of the main pond in the latter year. Abundant and in perfect flower and fruit. *Hab.*—Salt marshes, Massachusetts and southward; Gray.

44. Pluchea fœtida, *DC.* Kaighn's Point, 1865. Collected by Mr. Parker, in flower only, on the 21st Sept. *Hab.*—Ohio to Illinois, and southward; Gray. Florida and northward; Chapman.

45. Iva frutescens, *L.* Several specimens, collected in leaf along the western margin of the pond, Sept. and Oct., 1865. *Hab.*—Sea coast, Mass., and southward; Gray.

46. Parthenium Hysterophorus, *L.* Ballast Ground, Sept., 1864. Two specimens collected by Messrs. Parker & Diffenbaugh, in flower and young fruit. Kaighn's Point, 1866,—a single plant. *Hab.*—East and South Florida; Chapman.

47. Helenium quadridentatum, *Labill.* Ballast Ground, Oct., 1864. Rare. In flower and young fruit. Rather plentiful at Petty's Island in 1866. *Hab.*—North Carolina and westward; Gray.

48. Centaurea Calcitrapa, *L.* Kaighn's Point, 1865. Scarce. *Hab.*—Norfolk, Va.; Gray. Adv. from Europe.

49. Artemisia biennis, *Willd.* Abundant in waste places, for half a mile, about the Navy Yard, 1864, 1865, 1866. Also at Petty's Island in the latter

year, but not so plentiful. This plant, in full growth, is very much branched. *Hab.*—River banks, Ohio to Illinois, and northward; Gray.

50. Leontodon autumnale, *L.* Kaighn's Point, August, 1865, 1866. Petty's Island in the latter year. Rare. Fruit perfected. Nat. from Europe.

51. Pyrrhopappus Carolinianus, *DC.* Ballast Ground, 1864, 1865. Scarce. Kaighn's Point, 1866,—a single specimen only. *Hab.*—Sandy fields, from Maryland, southward; Gray.

62. Plantago heterophylla, *Nutt.* Ballast Ground and Kaighn's Point, 1865, 1866. Abundant in 1865. Less frequent in the latter year. Fruit perfected. *Hab.*—Maryland and Southward; Gray.

53. Anagallis arvensis, *L.*, var. cœrulea. Ballast Ground, 1866. A single specimen collected by Mr. Burk. Nat. from Europe.

54. Collinsia parviflora, *Dougl.* Ballast Ground, 1865. A single specimen collected in fruit by Mr. Burk. *Hab.*—South shore of Lake Superior, and thence westward; Gray.

55. Herpestis Monniera, *H. B. K.* Petty's Island. Collected by Mr. Burk in flower and mature fruit, on the 21st October, 1866. *Hab.*—Maryland and southward along the coast; Gray.

56. Conobea multifida, *Benth.* Ballast Ground and Kaighn's Point, Oct., 1865. Also at Petty's Island, 1866. Rare and in perfect fruit. *Hab.*—Ohio to Illinois, and southward; Gray.

57. Gerardia purpurea, *L.*, var. fasciculata, *Ell.* Ballast Ground, 1864, Oct., 1866. In flower and fruit. *Hab.*—Sea coast, South Carolina to Florida; Chapman.

58. Verbena bracteosa, *Mx.* Kaighn's Point, 1866. In flower only. Scarce. *Hab.*—River banks, Wisconsin to Kentucky, Gray.

59. Calamintha nepeta, *Link.* Ballast Ground, 1864. Two specimens collected in flower by Mr. Parker. Nat. from Europe, in Virginia and southward.

60. Heliotropium Europæum, *L.* Ballast Ground, 1864, 1865. A single specimen collected by Mr. Parker in 1864. In 1865 several additional ones in flower only. Maryland, Virginia, &c.; Gray. Nat. from Europe.

61. Heliotropium Curassavicum, *L.* Ballast Ground, 1865. A single plant growing in calcareous sand. Abundant and in full fruit at Petty's Island in 1866. *Hab.*—South Florida; Chapman.

62. Nama Jamaicensis, *L.* Ballast Ground, 1865. A single specimen in fruit. *Hab.*—South Florida; Chapman.

63. Batatas littoralis, *Chois.* Ballast Ground, Oct. 9, 1865. Several plants in early flower, but without fruit. Also in 1866, but without flowers. *Hab.* Sea coast, Florida to South Carolina; Chapman.

64. Ipomea tamnifolia, *L.* Ballast Ground, Sept. 7, 1865. A single specimen collected in flower by Mr. Burk. *Hab.*—South Carolina to Florida; Chapman.

65. Dichondra repens, *Forst.*, var. Carolinensis, *Chois.* Petty's Island. Collected by Mr. Diffenbaugh, Oct. 21, 1866, without flower or fruit. Not frequent. *Hab.*—North Carolina to Florida; Chapman.

66. Petunia parviflora, *Juss.* (Ann. Mus. 2, p. 216, t. 47.) Ballast Ground, Sept., 1864, 1865. Rather frequent. Also in 1866, but very scarce. Abundant at Petty's Island in the latter year. *Hab.*—Lower Rio Grande and

Mexican States, westward to California. (U. S. Boundary Survey, Emory, Vol. ii., Part i., p. 155.)

67. Roubieva multifida, *Moquin.* Ballast Ground, 1865. Sparingly distributed throughout the central portion of the ground. Fruit matured. Adv. from tropical America.

68. Obione arenaria. *Moquin.* Ballast Ground, 1865. A few specimens with ripe fruit. Also in 1866 but scarce. *Hab.*—Sea coast, from Massachusetts Southward; Gray.

69. Chenopodina maritima, *Moquin.* Ballast Ground, 1864—1865. Not frequent. Fruit perfected. *Hab.*—Salt marshes along the coast; Gray.

70. Euxolus pumilus, *Raf.* Ballast Ground, 1865. A single specimen collected in flower by Mr. Diffenbaugh. *Hab.*—Sea coast from Long Island Southward; Gray.

71. Polygonum minus, *Hudson.* Ballast Ground, 1866. Collected by Mr Burk. Scarce. Adv. from Europe.

72. Euphorbia polygonifolia, *L.* Ballast Ground. Rare and not in flower in 1865. In 1866 a single specimen in perfect fruit. Also at Petty's Island in 1866, one plant. *Hab.*—Shores of the Atlantic and Great Lakes; Gray.

73. Euphorbia herniarioides, *Nutt.* Ballast Ground, 1865. In fruit. Petty's Island, Oct. 21, 1866, in fruit. Frequent. *Hab.*—Banks of the Ohio and Mississippi Rivers; Gray.

74. Euphorbia Helioscopia, *L.* Ballast Ground, 1864. A single specimen. Found elsewhere in Pennsylvania, though rare. Nat. from Europe.

75. Euphorbia exigua, *L.* Kaighn's Point, 1866. Collected by Mr. Burk in fruit. Scarce. Adv. from Europe.

76. Acalypha gracilens, *Gray.* Ballast Ground and Kaighn's Point, 1865—1866. Rare in both years. Common southward.

77. Croton glandulosum, *L.* Ballast Ground, 1864, 1865, 1866. Frequent and in ripe fruit. More abundant in the last of these years. *Hab.*—Virginia, Illinois and southward; Gray.

78. Croton maritimum, *Walt.* Ballast Ground, 1865. Leaves only. *Hab.*—Drifting sands along the coast from North Carolina to Florida; Chapman.

79. Phyllanthus polygonoides, *Nutt.* Ballast Ground. A single specimen collected by Mr. Diffenbaugh, Oct. 1, 1865. Fruit scarcely perfected. *Hab.*—Along the Rio Grande and westward in Mexico, (Boundary Survey, Emory, Vol. II, p. 193.)

80. Juncus articulatus, *L.*, var. obtusior, *Engelm.* Kaighn's Point and Petty's Island, 1866. Not abundant. J. articulatus has hitherto been found in the United States only in New England and Western New York.

81. Juncus nodosus, *L*, var. megacephalus, *Tor.* Ballast Ground and Petty's Island, 1866. Not abundant. A northern plant not before found in the vicinity of Philadelphia.

82. Juncus bufonius, *L.*, var. fasciculiflorus, *Boiss.* Ballast Ground, 1865. Frequent. Dr. Engelmann states this to be a southern form widely diffused in intertropical regions.

83. Juncus Gerardi, *Loisel.* Petty's Island, 1866. Not frequent. *Hab.*—Sea coast from New Jersey northward; Gray.

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84. Cyperus fuscus, *L.* Kaighn's Point, 1865. In mature fruit. Adv. from Europe.

85. Cyperus Nuttallii, *Torr.* Ballast Ground, Sept. and Oct., 1865, 1866. Abundant in 1865, less so in 1866. Also at Petty's Island in 1866, but not very frequent. Fruit matured in every case. *Hab.*—Salt marshes from Massachusetts southward; Gray.

86. Cyperus Michauxianus, *Schultes.* Ballast Ground, 1864, 1865. Frequent along the margins of the pond. Fruit perfected. Less common in 1866. Marshes especially along the coast, from New England southward; Gray.

87. Cyperus rotundus, *L.*, var. Hydra, *Gray.* Ballast Ground and Kaighn's Point, Sept. and Oct., 1865, 1866. Abundant in both places in 1865; less frequent in 1866. Fruit matured, though most of the scales were empty. *Hab.*—Sandy soils along the coast from North Carolina to Florida; Chapman.

88. Cyperus compressus, *L.* Ballast Ground and Kaighn's Point, 1864, 1865, 1866. Frequent but least common in the latter year. Abundant at Petty's Island in 1866. Fruit perfected in each season. Found also in Maryland by Mr. Canby. *Hab.*—Florida to North Carolina and westward; Chapman.

89. Cyperus Baldwinii, *Torr.* Ballast Ground, 1864, 1865. Frequent in the sandy ground near the bulk-head, fruit perfected. *Hab.*—Florida to North Carolina and westward, Chapman.

90. Hemicarpha subsquarrosa, *Nees.* Petty's Island, Oct. 21, 1866. Scarce. Fruiting perfectly. Not before found near Philadelphia.

91. Lipocarpha maculata, *Torr.* Petty's Island, Oct 21, 1866. Scarce. Fruit perfected. *Hab.*—North Carolina to Florida; Chapman.

92. Fimbristylis spadicea, *Vahl.* Ballast Ground, 1865. Scarce, fruit perfected. *Hab.*—Salt marshes along the coast from New York southward; Gray.

93. Fimbristylis congesta, *Torr.* Ballast Ground and Kaighn's Point, 1865. Not scarce. In 1866 less common. Also at Petty's Island in 1866 but not frequent. *Hab.*—Florida and Westward; Chapman.

94. Fuirena squarrosa, *Mx.* Petty's Island, Oct., 1866. Scarce, fruit not matured. (Kaighn's Point in 1818. Barton in Flor. Phil. p. 37.) *Hab.*—Massachusetts and southward; Gray.

95. Alopecurus geniculatus, *L.* Ballast Ground. Collected by Dr. Martindale in 1865. Not before found in Pennsylvania.

96. Sporobolus Indicus, *Brown.* Ballast Ground and Kaighn's Point, 1865. Petty's Island, 1866. Not scarce, fruit perfected. The specimens from Petty's Island are prostrate, as in many maritime plants. *Hab.*—North Carolina to Florida; Chapman.

97. Spartina juncea, *Willd.* Ballast Ground, 1865, 1866. Sparingly distributed along the margin of the pond. Less frequent in the latter year. *Hab.*—Salt marshes and sea coast; Gray.

98. Eustachys petræa, *Desv.* Ballast Ground, 1865. Leaves and imperfect fruit; developed under glass by Dr. Leidy, it produced perfect fruit in 1866. *Hab.*—North Carolina to Florida along the coast; Chapman.

99. Cynodon Dactylon, *Pers.* Fully naturalized and abundant throughout the waste grounds below the Navy Yard. Also at Kaighn's Point, 1864, 1865, 1866. This plant was found at New Castle, Del., by Mr. C. E. Smith, in 1864. A second form of it, nearly smooth and more robust, having pointed

paleæ and the flowering culms included in their sheaths, grows sparingly along the margins of the pond and elsewhere in the vicinity in damp places. Mr. Burk has observed this second form for twelve or fifteen years past on the hard dry surface of the Point Road below the old Southwark Canal. He states it to have been more abundant in 1866 than ever before. *Hab.*—Pennsylvania and southward; Gray. Nat. from Europe.

100. Dactyloctenium Ægyptiacum, *Willd.* Ballast Ground and Kaighn's Point, 1864, 1865, 1866. Common in both localities. Rather less frequent in 1866 than before. *Hab.*—Virginia, Illinois and southward; Gray.

101. Leptochloa mucronata, *Kunth.* Kaighn's Point, 1865. Not frequent. *Hab.*—Virginia to Illinois and southward; Gray.

102. Leptochloa fascicularis, *Gray.* Kaighn's Point, 1866. Collected by Mr. Burk. Scarce. *Hab.*—Rhode Island and Southward along the coast; Gray.

103. Glyceria distans, *Wahl.* Spreading over the vacant lots west of the Ballast Ground. Abundant. *Hab.*—Salt marshes along the coast; Gray.

104. Brizopyrum spicatum, *Hook.* Ballast Ground, 1865, 1866. Staminate plants only. *Hab.*—Salt marshes; Gray.

105. Paspalum distichum, *L.* Ballast Ground, 1864, 1865, 1866. Along the wet margin of the pond, in similar places at Kaighn's Point, and in 1866 at Petty's Island. Abundant and with mature fruit. *Hab.*—Virginia and southward; Gray.

106. Panicum amarum, *Ell.* Ballast Ground, 1865. Two flowering specimens. Again in 1866, but only one or two plants not in flower. *Hab.*—Sandy shores, Connecticut and southward; Gray.

The Cutting Ant of Texas—OECODOMA TEXANA, Buckley.

BY GIDEON LINCECUM.

In many portions of Texas this species of ant is quite numerous and troublesome. It is capable of and actually does perpetrate more real perplexing injury to the horticulturist and farmer, than all the other types of Texan ants put together. In form and color the larger varieties of them do not differ in appearance very much from the agricultural ants. A great portion of our citizens speak of these two ants without distinction, as being the same species. There is, however, a well-marked difference in their community regulations; in their manners and customs, in their mode of constructing their cities, in their peculiar food and manner of preparing it, and in their civil and military governments.

There are five varieties or castes in this species, all of which may be seen in the same community, or city as I prefer to call it. They vary in size from that of a drone honey bee down to near that of the little black erratic ant; and their duties and vocations are as variant as their sizes. The largest size have wings and are the mother ants. They dwell in the ground in sandy lands, and one of their long established cities will, on an average, occupy at least two square rods of surface. The area of the city is considerably elevated; often one to two feet, and sometimes even more. The earth which is thus thrown up, and which is universally sand, is thrown out from their numerous and capacious cells below, and from their extensive tunnels or subterranean passages. To their cells they have many holes, or places of entrance, and some of them are tunnelled off several hundred yards.

It is known to many observant Texans that in all the larger cities the ants

have penetrated the earth to water. This accords with my not very limited experience on the subject. I know of a number of wells which were intentionally sunk in the cutting ant hills to procure water, and I have been informed by the owners of these wells, that ant cells, tunnels and live ants were found all the way down to the water. I have myself seen and drank water out of eight of these wells, and have accounts of many others. I have not heard of a failure in any attempt for obtaining water by digging in a cutting ant hill.

Mr. G. W. Brooks states that, in Chappel Hill, Washington County, Texas, Columbus Pearson dug a well in an ant hill and obtained plenty of water at the depth of thirty feet. The facts in this case worthy of notice, and for which it is here recorded, is the manner in which the ants had also sunk two wells to the water. These ant wells were large and well-formed, one of them being fully twelve inches in diameter, the other six inches, both going straight down to the water. The walls of these wells were travel-worn and stained of a dirty brown color, presenting the appearance of having been in use for years. Mr. Pearson states that, if these ant wells had been opened properly, a bucket could have been let down the largest one at the outset.

Dr. Fechtig, of Brenham, informed me that he had been making observations on the cutting ant for some months; and some of his discoveries, which he was kind enough to communicate to me, are valuable and of an interesting character, particularly as they afford additional testimony in favor of observations I have made in reference to the disposition of the dirt which comes out of their tunnels, &c. These passages are always commenced within the compass of the city mound; the sand that is taken from the tunnels is always thrown back on the mound. These tunnels are made at the depth of eight to twelve inches, and in the direction of the object for which they are excavated. Sometimes, as I will show presently, on extraordinary occasions they are carried at a much greater depth. Dr. Fechtig's case, which I will now relate, was a tunnel from one of their cities to a neighboring well; the tunnel entering the well ten or twelve feet below the surface of the ground. The well being walled with oak timbers, the ants had cut their way through to gain access to the water. In performing the boring through the thick oaken curbing, they threw down into the well so much saw-dust that the people were forced to strain the water previous to using it. On examination Dr. Fechtig found that a quantity of oak chips, similar to those which had been separated from the well water, had also been thrown out on the ant mound.

Situated in a garden at Austin, Texas, there was a large, very populous and seemingly prosperous cutting ant city. The ants had for years, in spite of many patent traps and newly discovered ant poisons, damaged the garden extensively. The proprietor of the garden at last conceived the idea that he would try to drown them, and for this purpose dug a large basin-formed pit in the ant mound, and led trenches into it right and left from the hillside above the ant city, to convey the water into the basin when it should rain. Not long after this preparation was completed, there came a tremendous rain storm. Large quantities of water rushed along the ditches into the basin dug in the mound. To the gentleman's surprise the basin did not fill, but seemed to send forth hollow sounds. After the rain was over it was found that all the water which had been conveyed into the basin had been swallowed up. There is a creek with a flat rock bottom about seventy yards from the ant hill, and it was discovered that the water from the trenches had rushed down the wells of the ant city, washing out, down to the rock, (22 feet), an immense hole, thence along a great tunnel on top of the rock, to the before named creek, where the entire sluice, charged with millions of ants and sand and mud, made its escape into the creek.

Under a beautiful wide spreading live-oak (Q. Virens) on the west border of the town of La Grange, Texas, there was an extensive and flourishing ant city. The city mound was large, occupying the entire area overshadowed by the

live-oak. Nearly on a level and not exceeding eighty yards from the ant hill, there was a considerable pond of filthy water, which, being in the street, the town authorities ordered it drained. A ditch was opened along one side of the street which intersected the ant mound near its center, and for the purpose of inundating and drowning the ants, the workmen let the water into the ditch, and when it reached the mound (which had been ditched through to its further side) it found many open passages, down which it flowed quite freely. It was near night when the workmen left it, with the water passing into and seeming to be rapidly enlarging the hole it had already opened in the mound.

The workmen and a number of the town people visited the place next morning. The pond was dry, and the ant mound had also disappeared; and what was more wonderful still, the large live-oak had settled down into the chasm that had been made by the disappearance of tbe ant mound, until the lower limbs of the tree were resting on the brink of it. (The lower limbs of a prairie live-oak are seldom more than six or seven feet above ground.) The outer ends of the very numerous live-oak roots were still clinging by their long ramifications in the walls of the great pit all around, and the large tree was swinging securely upon this net-work of roots as upon a hammock. But where did the water, mound and ants all go to? was the question among the La Grange folks. The Colorado river passes in its deep channel three hundred yards distant from the ant hill, and the popular supposition was, that the mound, ants and all, had passed through their great tunnel, which they had previously excavated, into the river. Several years have gone by, and still when it rains the pond vents itself through that ant chasm, and the live-oak, though still green and thrifty, has settled deeper in the ground. I know of many other wells and tunnels that were made by the cutting ants, but as I have recorded a sufficient number of them here to establish these great works as a characteristic trait in their national action, it is deemed unnecessary to add any more.

All the sand and other material that is seen piled on the ant mound comes from the wells, tunnels and cells which are excavated for the accommodation of the ants. The work required to throw up these quite conspicuous mounds must have consumed many years, as well as an immense amount of labor. All the sand-carrying labor is performed by the smaller sizes of ants, principally by the very smallest. These are of a dingy brown color, and when crowded have a woolly appearance. These little fellows are lazy and extremely slow in their motion; seeming to perform their daily work with great reluctance. They are often found crowding in each others way about the gates of the city, and do not seem to feel any interest in what they are doing, which is to carry sand day by day. For their size they carry large loads, but they lose the advantage of the big loads by their slow motions. The larger types of this species, which move with greater celerity, pay no attention to the sand carriers, but pass out and in, walking over them and their big loads of sand as if they were the pavement. While I observe the slow, careless action of these lazy little mound builders, I cannot avoid the conclusion that they are slaves.

As the cutting ants perform their destructive works mostly during the night, I have not made sufficient observation on their nocturnal action to state certainly that they employ their slaves in the leaf-cutting business at all. They have large mandibles and sharp teeth, and I think it likely that they are capable and, perhaps, do participate in the labors and duties of all the departments in the national works. The cutting ants subsist entirely on the leaves of vegetables. They will eat the leaves of various trees, shrubs and some herbaceous plants. I have not observed them eating of any of the grasses. Sometimes during warm spells in winter when, as I suppose, their provision stores have run short, I have seen them cutting and carrying home the buds of the long moss (Tillandsia usneoides.) I think, however, that this alternative is resorted to only in periods of great scarcity; as I have never observed them collecting the moss during summer, or at any other time while the season of green foliage continues. They seem to have a regular and well disciplined corps of foragers,

and these, after a suitable tree has been selected by their scouts for them to work at, go forth about twilight and, ascending the designated tree, frequently the tallest willow-oak, (Q. phellos) commence the work of destruction. They cut the green leaves into pieces not much less than a five cent piece, and seizing it near one corner with their capacious mandibles elevate it, and tilting it backwards over the crown of the head, it falls edgewise between two strong spines, or horns, which stand erect at the back part of the forehead. Having their load thus adjusted, which, to the observer, seems to stand on its edge on top of the head and lengthways with the body, they hasten away to the appointed place of deposit. It is quite an interesting sight to observe with what precision and celerity they can edge their piece of leaf along amongst hundreds of their fellow laborers who are all carrying similar burthens, while they are meeting on the path an equal number of workers who are hurrying back to the tree empty.

They deposit the leaves on the ground at the place appointed for curing them, where they are left to dry in the sun through the succeeding day. Sometimes the new cut leaves are deposited near the entrance to the city; at other times they are strewed thickly along the path from the tree to the city; and not unfrequently they are thrown down in a pile near the root of the tree from whence they were taken. In either case they are left exposed all day in the sunshine; und they are, during the succeeding night, carefully gathered up and taken into the city; this rule obtains in autumn; they do not cure their leaves until towards winter. All summer time they are carried directly from the tree into the city. Whilst the dried leaves are being stored away, the foragers are engaged in cutting and laying out a quantity of fresh leaves, which undergo the same processes of curing and storing as the previous lot; and so on through the season for storing up food for winter. But should a shower of rain fall upon and wet the laid out leaves while they are out drying, it renders them unfit for food, and they are not stored. I have noticed many piles of these spoiled leaves rotting on the ground that had been damaged by being caught in the rain.

In my observations on the habits of the cutting ants, I have not discovered them eating anything besides the foliage of various plants. Neither have I ever noticed them carrying anything else into their cities. Prof. S. B. Buckley, who is a very close and accurate observer, states that he saw them carrying hackberries (Celtis occidentalis) and that they eat insects, tumble bugs, &c. The hackberry has a sweet pulpy covering, and I think it likely that if one of the leaf-eating ants was to find a hackberry, it would try to carry it home; but it being a perfect globe, a little too large for the span of its mandibles, I see not how it could effect it. As to their feeding on insects, I shall not pretend to deny it, for these wonderful, cunning and very sagacious ants doubtless perform many habitual actions that have passed unnoticed in my eighteen years observation.

It is stated that this species of ant does not lay up stores of provisions for winter supplies. I have not opened one of their cities during winter, and therefore cannot assert that they do. But from the immense quantities of leaves collected by them during the autumnal months, which are carefully sun dried and taken into the city, I should feel at a loss to say, if it is not intended for winter food, what other use they can put such quantities of leaves to; and furthermore, when it is known to be the kind of food upon which they subsist. It is also known that they construct cells from fifteen to twenty-five feet below the surface—below the line of change of temperature,—and in these deep subterranean apartments for their winter quarters, they would not become torpid, but would remain active. Now, if during the warm season it is necessary for them to consume the almost incredible amount of leaves which we see them daily carrying in, it becomes a matter of surprise—an unaccountable thing indeed—how they can make out through the winter months without anything to eat, when we know that they are not in a torpid state but lively and active.

In this vicinity within the last two years, (1861) the cutting-ants have greatly diminished. Many large cities have dwindled away to a few thinly populated holes; whilst many others are entirely depopulated. This, I think, is mainly attributable to the protracted dry weather. With many other species, particularly the agricultural and little black ants, long drouths seems to favor their increase. Not so with the cutting ant. They evidently decline. A seven years drouth would cause their wells to dry up as it did many of the wells belonging to the *genus homo*. I know of several very pretty homes that were evacuated the present year by human families, on account of the failure of their wells. Their wells dried up, and as they could not deepen them sufficiently to obtain a supply of water, they were obliged to leave their long cherished and well-fixed homes. The ants have done the same thing, and as I think for the same reason. Their wells also failed and they have perished for want of water, or have emigrated to districts more congenial to their peculiar mode of life. Anyhow, they have greatly diminished, and many large cities are actually depopulated and lying in ruins.

On the first of August, 1861, I discovered in a grove of thick timber and much undergrowth, a great many cutting-ant holes. They were all around in the bushes, extending perhaps over an acre of ground. They were all alike of recent date; their newly thrown up little heaps of fresh sand was what first attracted my attention. Finding them there on the hill-side, and actually boring holes in the thick woods, was a performance so entirely contrary to their customary habits, that I was led to the examination of the matter, and if possible to ascertain the cause of this strange unantlike proceeding. My first impression was, there being a large and very ancient city a few hundred yards distant from the new settlement, that it was the work of the recently thrown off queens from that old kingdom; that the young queens had stopped short in the shady woods in consequence of the hot dry weather, and were setting up for themselves in a new style, it being on a declivity and in a densely shaded woodland. I however excused them for all these flagrant deviations from their long established customs, by laying it to the continuous drouth and hot weather. I did not leave them until I had marked the place that I might visit them again, and find out how such a multiplicity of new settlements in so small a track of country would manage in the future. I then paid a visit to the large old ant city spoken of above. I had many times within the preceding twelve years, visited and made observations on its extraordinary public works. When I came there I was astonished to find that its inhabitants were all gone. I found only the large old mound of sand, now smoothed down by time's sweeping winds and the passing cattle, but there were no inhabitants—all had disappeared. They had evidently emigrated to the new settlements I had encountered down the hillside in the thick shady forest, and the inhabitants thereof were not, as I at first surmised, the newly commenced communities of the young queens, but emigrating parties who had gone out from the old city in search of water. Their wells having failed, they could no longer remain in the city, and having left it, had proceeded lower down the hill, and hoping to find water, were sinking many new wells. Subsequent observations have confirmed me in this opinion. The new settlements in a short time were evacuated. Having been unsuccessful in obtaining water at the new place, the ants had either died out or gone to some other district.

In accordance with my observations on this subject, I am forced to the conclusion that the drouth continued too long for them; that in districts where the wells are liable to dry up they often perish. I find that the kingdoms that are located near a constant stream, are in a flourishing state, and have continued so through all the time of the protracted dry season.

The cutting-ants plant seeds of various trees, vines and other plants. When they locate a city in bald prairie, which is often the case, where they cannot procure the seeds of trees, they cultivate the prickly poppy (Argemone Mexicana,) the most appropriate plant for their purpose that grows on the prairie.

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The seeds of this poppy are planted over the greater portion of the crown of the city mound; the plant springs up during the autumnal rains, forms strong roots in the course of the winter, and by the time the sun becomes oppressively hot the next spring, it has grown up two or three feet high, with umbrageous green foliage and many large white flowers, and affords ample shade to the city.

When the ants locate a city on some sunny point near the timbered lands, they do not plant the poppy, but appear to prefer certain trees and vines for shade. For this purpose they plant the seeds of the prairie dogwood, (Viburnum dentatum), Yopon, (Ilex vomitoria), Hackberry tree, (Celtis occidentalis), Gum elastic tree, (Bumelia lycioides), the mustang grape, (Vitis Texana), Cocculus carolinus, and occasionally the prickly ash (Xanthoxylum fraxinium.)

It is often seen in cases of long established cities, that grape vines spread themselves over the tops of the grown up shade trees, and the large luxuriant foliage becomes so dense that it forms a shelter sufficient to turn a smart shower of rain. From the scorching rays of the sun these thrifty vines afford thorough protection.

Notwithstanding the notable fact that all the plants these ants cultivate, produce nuts, pulpy fruits and large seeds, I have not discovered that they make use of any of them for food. They appear to be a selection for shade, and so far I have not observed that they have any other use. If, however, after a more careful investigation it shall be discovered that they cultivate the vines, trees and fruitful shrubs for the double purpose of both shade and food, we must accord to them a share of sagacity and far-reaching forethought almost incredible.

I have occasionally discovered colonies of small sized red ants, which in form resemble the smallest type of the cutting ants. They dwell in the ground. I have not seen them cutting or carrying leaves. I have observed them thickly covering a greasy rag, places where syrup had been spilt, and where coffee grounds had been thrown aside at my hunting camps. They are not often met with, and as I now think, never will be, so long as the superior and very numerous race of cutting-ants inhabit the land.

The smallest type found in the cities of the cutting-ants, which I have before alluded to as being slaves, are in shape, size, color, and all their peculiar motions, precisely the same. How happens it that the same species of ant should occupy two very distinctly marked conditions? In one he dwells in small colonies, makes very little mark, is never wealthy, and does not remain long at the same station. In the other he is a slave!

How the cutting-ant manages to make slaves of the smaller race is as yet an unsolved question. The cutting-ant does, to be sure, perform all his thieving operations at night, or by the aid of an underground passage, if in the day time. Consequently our observations on the mode of carrying on the slave-trade must necessarily be tedious and limited. But the cutting-ants have what I take to be slaves in great numbers; and the same type that constitutes their slave population, is found sometimes free, but very poor and in straggling communities.

The fact that these little sand-carrying ants are a servile race, I think cannot well be denied. If they are produced from the eggs of the cutting-ant by a peculiar process of feeding, as is the case in producing the various types found in a community, or hive of honey bees, then the conclusion will follow, that there are no proper communities of the smaller type, and the little nests that I have occasionally seen of them, were nothing more than companies of badly managing absconded slaves.

26th February, 1861. There was a heavy rain last night. To-day it is very clear and pleasant; thermometer 70°. Everything that has life in it or can grow is in motion. I was out on the prairie botanizing, and while resting in the shade of a large live-oak which was nearly in full bloom, I discovered great numbers of all sizes of the cutting-ants ascending and descending the tree. On the ground beneath the tree were thousands of the ants carrying

pieces of the leaves of various plants. The greater portion were carrying the leaves of the live-oak. Some of the leaves were faded and nearly dry, and all were the growth of the previous year. Seeing no ant hill near I undertook to find out how far they carried their leaves through the thick grass. In a short time I discovered that they carried them above ground but a small distance to a little pile of leaves and trash, under which they went dragging their cut leaves with them. Turning up the little pile of leafy trash, which seemed to have been driven there by the winds, in a depression of the ground that was probably an old horse track, there was a hole a full inch in diameter. Not a particle of dirt had been thrown out around it, and yet the hole was large and slanted away to the northwest. There were thousands of the ants at work in the shade of the live-oak, gathering up the leaves that were being constantly cut down from above, and on closer scrutiny I found several other holes into which they were going with leaves. These holes also slanted off under the surface, but had no earth thrown out around them, and were all alike concealed with leaves and little sticks. All the holes were crowded with the ants going in with leaves, or coming out empty. With such a number of ants and so many holes one would expect to find heaps of earth piled out around them, but such was not the case. The holes were the outer termini of the subterranean passages they had run out from their city, about fifty yards distant, and piled on their city mound lay the sand that came from the passages. These passages, or tunnels, are constructed for the purpose of avoiding the almost insurmountable difficulty they would have to encounter in the effort to carry their leaves through the tangled grass; and also apparently to make it possible for them to obtain food in times of scarcity during the cold weather. The cutting-ants are very easily stiffened with the cold air, and cannot succeed in scrambling through fifty yards of thick grass with a leaf of a cold day. But with the underground roads, in almost any kind of weather, they can go to the terminus, hastily run out and snatching up a recently fallen live-oak leaf, take it home through the tunnel without difficulty.

I saw the ants carrying nothing but leaves during this day's observation, neither have I ever observed this species collect any other kind of food except small flowers and the petals of larger ones; but these are no more than tender leaves.

At the ant city there appeared to be a great turn out of the ants this fine day. I noticed four sizes of them. Most of the slaves were engaged packing out sand upon the city mound. There were, however, a considerable sprinkling of them in company with the larger sizes packing leaves. I noticed also a great number of their giants, walking to and fro with the laborers, but they performed no work that I saw. The giants are large, and have a large head with strong mandibles. They are well-formed for the execution of much of their kind of labor; but I did not discover that they did any work, though they were passing up and down the tree and along the road with the laborers all the time. All the small ones—the slaves—and the second sized ones—which may also be slaves—were unremitting in their labors. The third size, or class, also carried leaves quite busily.

This species of ant often carry their subterranean roads to the distance of several hundred yards from the city in grassy districts, but where the grass has been destroyed, they do not construct the underground passages, but travel over land in nicely cleared out roads, which are seen radiating from the city mound and extending to various trees, or spots of herbage which produce suitable leaves for their subsistence. To see one of these well-cleared roads extending in a continuous line from the city to some tree or garden two or three hundred yards distant is indeed remarkable. This fact, in a district nude of grass, occurs so often that it cannot be attributed to chance, or blind instinct. Some of the engineers in their excursions in search of supplies, often wander to the distance of four or five hundred yards, or even further, and finding a plentiful source of good food, would find no difficulty in con-

ducting parties the best route to it; and soon a good smooth road is constructed, over which in crowds the workers are seen through the night, or in cool cloudy days, transporting the leaves to the city. This is their mode, invariably, in a country where the grass has been destroyed, and we can see and understand the method and the purpose for which they work. But in a country which is heavily coated with high grass, it is not so easy to discover by what process they lay off a tunnel and successfully carry it in a direct line to the selected tree or garden spot a quarter of a mile distant, and sometimes beyond a considerable streamlet of running water.

On one occasion, on a log that lay across the Ye Gua Creek, the ants passed over to a gentleman's garden and were rapidly cutting his vegetables to pieces. The owner hoping to rid the garden of these troublesome insects, cut the log away and it floated off down the creek. He was mistaken in his calculations, for it was but a few days after when the ants were ravaging the garden in as great numbers as they were previous to the removal of the log. After searching unsuccessfully for some interlocking tree that might afford them a passage, it was observed that the ants came out from several holes, situated on the creek side of the garden. Subsequently it was discovered that, on a large ant mound crowning a sandy point near the edge of some post-oak timber, two hundred yards from the creek, there were quantities of the black soil of the Ye Gua bottom thrown out, proving that the second visit of the ants to the gentleman's garden had been effected by a tunnel beneath the bed of the creek; the channel of the creek, at that place is fifteen or twenty feet deep, and from bank to bank on top of the bluff about thirty feet.

By what degree of the *instinctive* powers was all this engineering and truly great project accomplished.

I have never seen the cutting ants fighting among themselves, or with any of the other species. I look upon them as the most peaceable, the most sagacious, and at the same time the most destructive of the ant kind.

March 5th.

The President, DR. HAYS, in the Chair.

Thirty-six members present.

The following papers were presented for publication:

"On the Structure of Lopezia." By Thomas Meehan.

"Mammalogical Notices." By J. H. Slack, M. D.

March 12th.

MR. CASSIN, Vice-President, in the Chair.

Forty-two members present.

The death was announced of Prince Maximilian, of Wied, a Correspondent.

The following was presented for publication:

"The necessity of Nebular Rotation." By J. Ennis.

Prof. Cope exhibited the fossil skull of a large turtle, from a soft granular limestone belonging to the cretaceous formation of Barnsboro, Gloucester Co., N. J. It was characterized under the name of Euclastes platyops. The length of the skull is 11 inches; its breadth 8½ inches.

March 19th.

The President, DR. HAYS, in the Chair.

Thirty-nine members and correspondents present.

The following were presented for publication:

"On Euclastes, a genus of extinct Chelonidæ." By E. D. Cope.

Prof. Leidy exhibited a number of plates of a forthcoming work on the extinct mammals of Nebraska and Dakota, comprising about seventy species. Among these he exhibited the representation of a skull of a new ruminant which he characterized under the name of Agriochoerus latifrons.

In answer to a question, Prof. Leidy remarked that he had never detected the slightest evidence of the former existence of the Hippopotamus in America. Remains reported as such had turned out to be inferior tusks of Mastodon, &c.

Prof. Cope presented to the Academy a young specimen of the whale, known as the Bahia Finner, procured near Bahia, Brazil, the length of which was 21 feet. He said it belonged to the genus Megaptera, Gray, with the hunchback whales of sailors. The evidence consists in the very short di- and parapophyses of the cervical vertebræ and the absence of all trace of acromion and coracoid processes. The orbital processes of the frontal are narrowed externally and the muzzle considerably narrowed. Judging from the name, it possesses a more fully developed dorsal fin than the other Megaptera. It should be called Megaptera braziliensis.

A letter was read from Prof. J. P. Kirtland, of Cleveland, Ohio, giving an account of the death of Major Robert Kennicott, which occurred on the 13th of May, 1866, at Nulato, on the Yukon River, 600 miles above its entrance into Behring's Sea.

March 26th.

The President, DR. HAYS, in the Chair.

Thirty-nine members present.

The resignation of membership of O. N. Barnes was tendered and accepted.

The death was announced of Washington L. Sherman, M. D., U. S. A., a member, on May 4th, 1865.

The following were elected members:

Samuel Ashhurst, M. D., Francis Ashhurst, M. D., Rev. I. L. Beman, Charles Smith, Thomas Earp, Charles Taylor, Moro Phillips, Samuel Welsh, Lewis Cooper, Benjamin B. Comegys, S. C. Morton, Mrs. E. P. Long and Miss Bohlen.

The following were elected correspondents:

Hon. George P. Marsh, Florence, Italy; Dr. Gideon Lincecum, Long Point, Texas; John R. Willis, Halifax, N. S.; and Samuel H. Scudder, M. D., Boston, Mass.

On favorable report of the respective committees the following papers were ordered to be published:

[Inside back cover]

PUBLICATIONS

OF

THE ACADEMY OF NATURAL SCIENCES

OF PHILADELPHIA.

Five volumes of the New Series of the Journal and Part I. of Vol. 6 (Quarto) have been issued,—1847 to 1866. The price per volume of four parts is $10.00, or $3.00 per part to members; and to the public, $12.50 per volume, or $3.75 per part.

The First Series of the Journal, 1817 to 1842, in eight volumes, octavo, may be obtained at $24.00, or for separate volumes $3.25 per volume.

The First Series of the Proceedings of the Society, published in octavo, 1841 to 1856, of which eight volumes were completed Dec. 31, 1856, may be obtained at $24.00, to members; and to the public, $30.00.

The Second Series of the Proceedings, commencing Jan. 1, 1857, (of which ten volumes are now completed, Dec. 31, 1866,) may be obtained at $30.00, to members, or $3.00 per volume separately; and to the public, $3.75 per volume. These are now published monthly at $3.00 per annum, payable in advance, to members; and to the public, $3.75.

The Society has established a Publication Fund; any person who may contribute the sum of $75, will receive, during life, the Journal, quarto, and the Proceedings, octavo; or separately, the Journal $50, and the Proceedings $25.

BOOKS FOR SALE.

The Academy have a few copies of the following rare works, for sale at the prices affixed.

Michaux' North American Sylva, 2 vols. octavo, Philadelphia, 1841, with 156 uncolored plates, $10.00.

Monograph of the Unionidæ of North America, by T. A. Conrad. Complete with 60 colored plates, octavo, 1840, $8.50.

Fossils of the Tertiary Formation of the United States, by T. A. Conrad. Complete, with 49 plates, octavo, 1838, $5.00.

Description of Shells of North America, with 68 colored plates, by Thos. Say, 1830—34, $10.50.

NOTICE TO BOOKSELLERS.—All the Publications of the Society will be supplied to Booksellers at a discount of 20 per cent. on the prices charged to the public.

Application to be made to WM. S. VAUX, Chairman of the Publication Committee, 1700 Arch Street, or to the Librarian, at the Hall of the Academy, corner of Broad and Sansom Sts.

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January 1st, 1867.

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